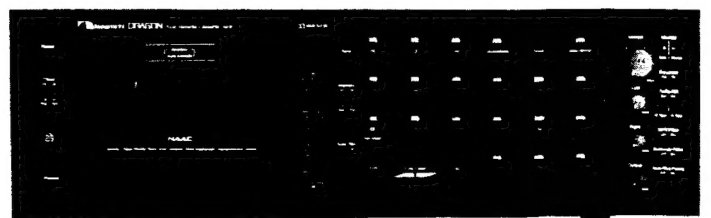




Service Manual

Nakamichi DRAGON

Auto Reverse Cassette Deck



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1. GENERAL

1.1. Voltage Selector

Voltage selector is installed on the rear panel for Other version of the Nakamichi DRAGON. This voltage selector can select either 120 V or 220-240 V at customer's disposal.

1.2. Parts List for Carton and Packing

Part No.	Description	Q'ty
OF03685B	Inner Carton	1
OF03686B	Outer Carton	1
OF03629B	Packing	2

2. MECHANICAL ADJUSTMENTS

2.1. Mechanism Control Cam Adjustment

Before adjustment, remove the Front Panel Ass'y and the Cover Plate.

(1) Offset Adjustment of Control Motor Driver

(a) Refer to Fig. 2.1.

Adjust VR604 and VR603 on the Logic P.C.B. Ass'y to locate approximately at the middle of the variable range. Then turn ON the Power switch.

VR604 (for Cam position stop)

VR603 (for Cam position play)

(b) Press the Stop button to set the cassette deck in Stop mode. Adjust VR604 (for stop) so that the "S" mark on the Cam corresponds to the pointer on the mechanism chassis.

(c) Press the Play button to set the cassette deck in Playback mode. (Cam will rotate, and the position marked with "PY" comes to the pointer.) Adjust VR603 (for play) so that the "PY" mark on the Cam corresponds to the pointer.

(d) Repeat above (b) and (c) 2 - 3 times so that the "S" and "PY" marks on the Cam correspond to the pointer accurately in Stop and Playback modes respectively.

(This adjustment is required because the position adjusted by one volume will be slightly changed when the other volume is adjusted.)

(e) Set the cassette deck in F.F., Pause, or Cue mode by pressing each button. Check to insure that the pointer is in a range of "F", "PS", "CU" mark respectively.

(f) If out of the range, precise adjustment for each position according to "(2) Offset Fine Adjustment of Control Motor Driver" will be required.

(2) Offset Fine Adjustment of Control Motor Driver

Adjust only if a satisfactory result is not obtained in "(1) Offset Adjustment of Control Motor Driver". This adjustment is made by changing the value of the fixed resistors on the Logic P.C.B. Ass'y. Note: The value of voltage is typical value.

(a) Observation Point of Reference Voltage

Observe the each voltage at the sliding contact of the Cam Control Volume VR605 (10 k Ω) in Stop, Fast (F.F. or Rew.), Pause and Playback modes.

(b) Reference Voltage

Reference voltage at the sliding contact of VR605 (Cam Control Volume) in each mode is as follows:

Mode	Reference Voltage (Typical Value)
Stop	0 V
Fast (F.F./Rew.)	-2.0 V
Pause	-6.5 V
Play	-9.1 V
	2.0 V \pm 0.25 V
	2.6 V \pm 0.4 V

(c) Resistors for Adjustment

Mode	Ref. No.	Typical Value
Fast (F.F./Rew.)	R640	22 k Ω
Pause	R643	76.8 k Ω (F)
Play	R639	10 k Ω

(d) Adjustment Procedures

- Set the cassette deck in Stop mode, then check to insure that the voltage at the sliding contact of VR605 is 0 V (\pm 0.3 V).
- Set the cassette deck in F.F. mode, then adjust the value of

R640 so that the voltage at the sliding contact of VR605 will become lower by 2.0 V (\pm 0.25 V) than in Stop mode.

- Press the Pause button to set the cassette deck in Pause mode. Adjust the value of R643 to obtain -6.5 V (\pm 0.4, -0.15 V) at the sliding contact of VR605.
- Set the cassette deck in Playback mode, then adjust the value of R639 so that the voltage at the sliding contact of VR605 will become lower by 2.6 V (\pm 0.4 V) than in Pause mode.

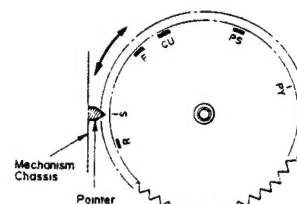


Fig. 2.1

2.2. Reel Motor Speed Adjustment in Play mode

- Connect a DC voltmeter to TP1 and GND on the Logic P.C.B. Ass'y.
- Without loading a cassette tape, set the cassette deck in Play mode.
- Adjust VR601 on the Logic P.C.B. Ass'y to obtain -4 V on the DC voltmeter.

2.3. Record Head and Playback Head Tilt Adjustment

Note: On items 2.3 - 2.9, refer to Fig. 2.2 flow chart. Refer to Figs. 2.3 and 2.4.

- Load a Tilt Check Gauge M-9039 (DA09039A) in the cassette deck.
- Clip the grounding terminal of the Tilt Check Gauge with one end of the cord with clip, and the chassis of the cassette deck with the other end.
- Remove both of the Height Gears.
- Set the cassette deck in Play mode. Check to insure whether the Beacons Playback Head "Upper" or "Lower" and Record Head "Upper" or "Lower" are illuminating. In order not to give damages onto the head surfaces, push both of slide knobs of the Gauge to the direction of arrow marks, then return them to the original place to be in contact with record head and playback head surfaces after Play mode is securely locked.
- Check to insure freedom from contact between the Gauge and pad lifter.
- Beacon Playback Head "Lower" will light on when height adjustment screw (P) turned clockwise but Playback Head "Upper" when counterclockwise. Adjust so that both "Upper" and "Lower" will light on even when you move the slide knob to the direction of an arrow mark and then return it to the original place.
- Same procedures will apply to the Beacons Record Head "Upper" and "Lower", except for the height adjustment screw (R).
- Set the cassette deck in Stop mode and fit both of the serrated Height Gears. Then set the cassette deck again in Play mode and insure all of the 4 Beacons are illuminating. If not, (3) through (7) will have to be repeated till satisfactory results are obtained.

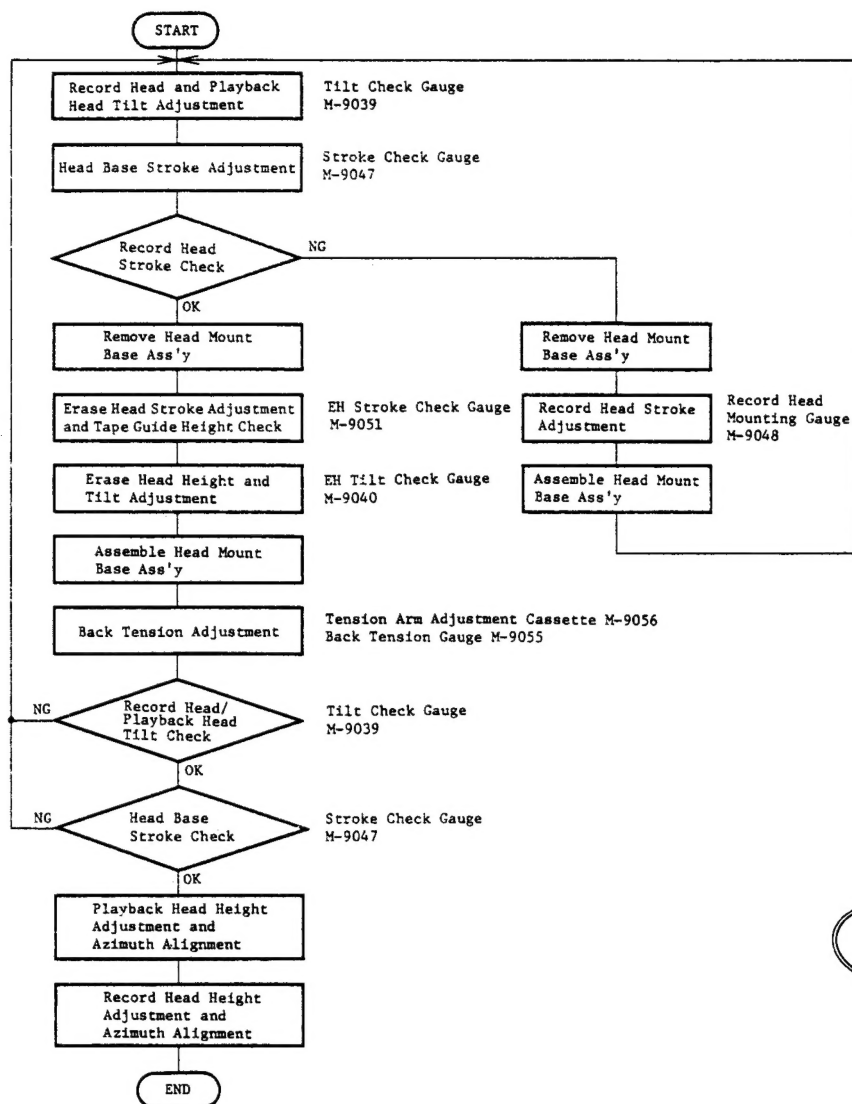


Fig. 2.2

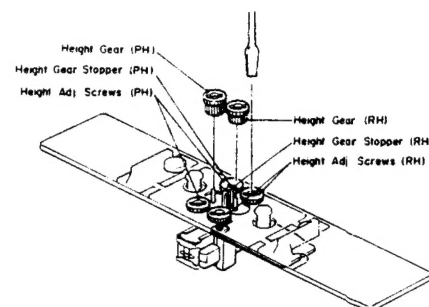


Fig. 2.3

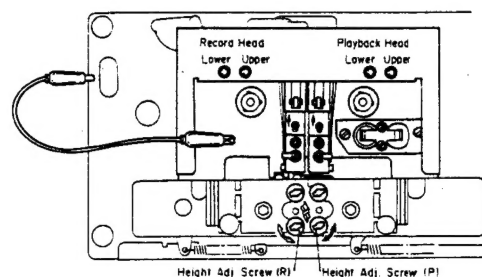


Fig. 2.4

2.4. Head Base Stroke Adjustment

Refer to Fig. 2.5.

Note: Before you conduct this adjustment, adjust with a "Tilt Check Gauge" to insure freedom from tilt on the playback head and record head.

(1) Head Base Stroke Adjustment in Play Mode

- Load a Stroke Check Gauge M-9047 (DA09047B) in the cassette deck.
- Move Record Head Indicator and Playback Head Indicator to the direction of arrow mark "A" with your finger tip and then set the cassette deck in Play mode. Then slowly release the Indicators and insure whether each of the Indicators is in contact with record and playback heads.
- Check to insure whether the "P" pointer on the Playback Head Indicator locates between the 2 lines on the Indicator Plate.
- If the playback head stroke is noted to be misaligned, adjustment can be made by moving the stroke adjuster assembled in the head base assembly (either forwardly or backwardly).
- Check to insure whether the "P" pointer on the Playback Head Indicator locates between the 2 lines on the Record Head Indicator, thus check can be made on record head stroke.

- If the record head stroke is noted to be misaligned, adjustment can be made with a Record Head Mounting Gauge M-9048 (DA09048A).

(2) Head Base Stroke Adjustment in Cue Mode

- Load a Stroke Check Gauge M-9047 (DA09047B) in the cassette deck.
- Move Record Head Indicator and Playback Head Indicator to the direction of arrow mark "A" with your finger tip and then set the cassette deck in Cue mode. Then slowly release the Indicators and insure whether each of the Indicators is in contact with record and playback heads.
- Check to insure whether the "C" pointer on the Playback Head Indicator locates between the 2 lines on the Indicator Plate.
- If the playback head stroke is noted to be misaligned, adjust VR602 on the Logic P.C.B. Ass'y till satisfactory results are obtained.
- After completion of the Head Base Stroke Adjustment, check to insure accuracy of the Head Base Stroke Adjustment in Play mode. If the above are inaccurate, items (1) and (2) will have to be repeated till satisfactory results are obtained.

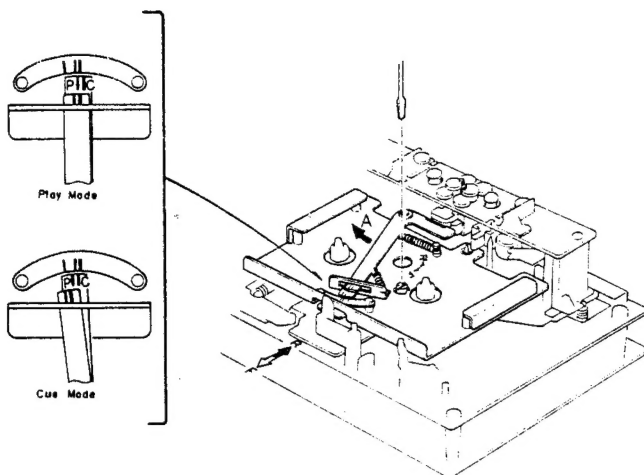


Fig. 2.5

2.5. Erase Head Stroke Adjustment and Tape Guide Height Check

Remove the Head Mount Base Ass'y.
Refer to Figs. 2.6 and 2.7.

- (1) Erase Head Stroke Adjustment
 - (a) Load an EH Stroke Check Gauge M-9051 (DA09051A) in the cassette deck.
 - (b) Set the cassette deck in Play mode, thus check can be made on erase head stroke through the EH Stroke Indicator.
 - (c) Check to insure whether the erase head surface is aligned with red line on the EH Stroke Indicator. If not, adjust the erase head stroke by loosening 2 screws A that assemble erase head and erase head plate.
 - (d) After completion of adjustment, 2 pcs. of screws shall be locked with lock tight paint.
- (2) Supply Tape Guide Height Check
 - (a) Load an EH Stroke Check Gauge M-9051 (DA09051A) in the cassette deck.
 - (b) Set the cassette deck in Play mode.
 - (c) Slide the Supply Tape Guide Check Bar down against the supply tape guide, and check to insure that the Supply Tape Guide Check Bar is accepted by the supply tape guide.
- (3) Take-up Tape Guide Height Check
 - (a) Load an EH Stroke Check Gauge M-9051 (DA09051A) in the cassette deck.
 - (b) Set the cassette deck in Play mode.
 - (c) Slide the Take-up Tape Guide Check Bar down against the take-up tape guide, and check to insure that the Take-up Tape Guide Check Bar is accepted by the take-up tape guide.

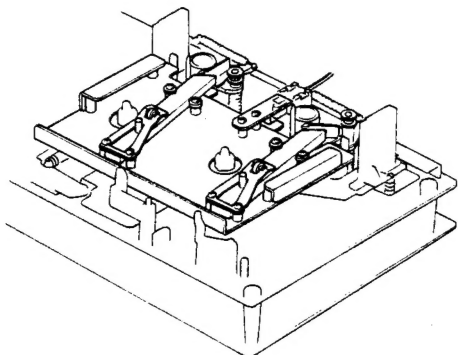


Fig. 2.6

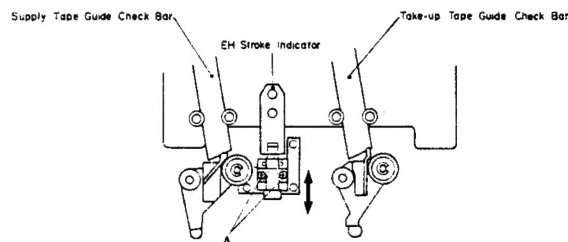


Fig. 2.7

2.6. Erase Head Height and Tilt Adjustment

Refer to Figs. 2.8 and 2.9.

- (1) Remove Head Mount Base Ass'y.
- (2) Load an EH Tilt Check Gauge M-9040 (DA09040A) in the cassette deck.
- (3) Set the cassette deck in Stop mode.
- (4) Check to insure whether one of the 3 Beacons is illuminating. Look down the mirror as shown by an arrow mark and slowly turn the Screw "Height" counterclockwise (or clockwise) so that the two horizontal lines on the mirror will become superposed on the line (in different color) of the erase head, and check to insure whether Beacon "1" is illuminating.
- (5) Turn Screw "Tilt" counterclockwise (or clockwise) to light on Beacon "2". Excessive turning will cause the Beacon "1" to light off. Adjustments of Screw "Tilt" will therefore be conducted till both of the Beacons "1" and "2" illuminate.
- (6) Turn Screw "Azimuth" counterclockwise (or clockwise) to light on Beacon "3". Excessive turning will cause either Beacon "1" or "2" to light off, and therefore adjust Screw "Azimuth" until all of the 3 Beacons "1", "2" and "3" illuminate.
- (7) Check to insure whether the horizontal line on the mirror corresponds to that on the erase head. If not, (4) through (7) will have to be repeated till satisfactory results are obtained.
- (8) After completion of adjustment, 3 pcs. of screws shall be locked with lock tight paint.

Note: Before use of this gauge, check to insure freedom from dust or dirt, or overflow in the groove of the erase head surface.

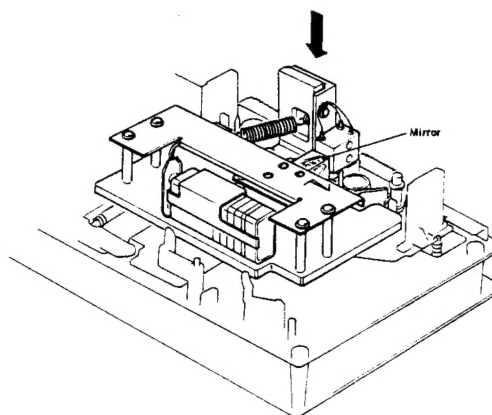


Fig. 2.8

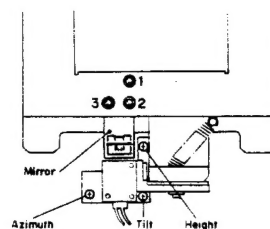


Fig. 2.9

2.7. Back Tension Adjustment

Refer to Figs. 2.10 — 2.13.

- (1) Load a Tension Arm Adjustment Cassette (DA09056A) in the cassette deck referring to Fig. 2.10.
- (2) Set the cassette deck in Play mode.
- (3) Bend the Back Tension Arm with pliers so that the gap between the Cassette Holding Spring assembled on the Head Base Ass'y and the Back Tension Arm becomes 0.5 mm as shown in Fig. 2.11. Do not bend the top of the Back Tension Arm.
- (4) Set the cassette deck in Stop mode, and remove the Tension Arm Adjustment Cassette (DA09056A), then set the cassette deck in Cue mode. In Cue mode, check to insure that the gap is found between the Supply Reel Hub B Ass'y and the Felt of Back Tension Ass'y as shown in Fig. 2.12.
- (5) Load the Back Tension Gauge (DA09055A) in the cassette deck.
- (6) Set the cassette deck in Play mode and read the torque value of Back Tension Gauge. If the value is in a range of 6 g-cm to 10 g-cm, adjustment is not necessary. If not, change the installation point of the Back Tension Spring as shown in Fig. 2.13, and obtain the torque of 7 g-cm to 9 g-cm range.

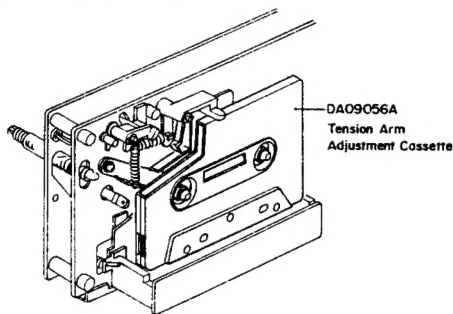


Fig. 2.10

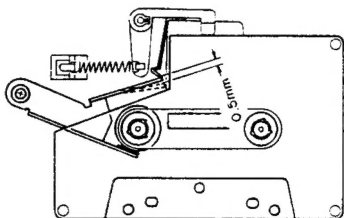


Fig. 2.11

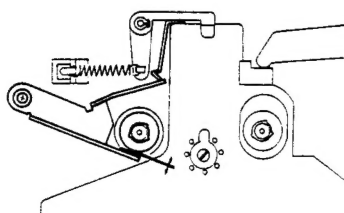


Fig. 2.12

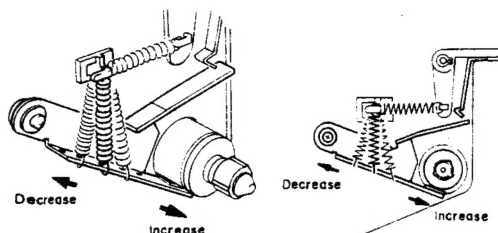


Fig. 2.13

2.8. Playback Head and Record Head Height Adjustment and Azimuth Alignment

Refer to Figs. 2.14 and 2.15. Perform the following adjustments successively.

- (1) **Playback Head Height Adjustment**
 - (a) Set the Monitor switch to Tape, Tape Selector button to ZX and Eq. switch to 70 μ s.
 - (b) Connect a VTVM to Output Jacks.
 - (c) Load a 1 kHz Track Alignment Tape (DA09007B) and set the cassette deck in Forward-Play mode.
 - (d) Turn the PH Height Gear until the outputs of both channels become minimum on the VTVM.
- (2) **Azimuth Reference Position Adjustment**
 - (a) With the Cassette Holder open, press the Forward-Play button. Adjust VR824 on the Auto Azimuth P.C.B. Ass'y so that the Alignment Indicator coincides with the Pointer in the Azimuth Alignment Motor Ass'y. Refer to Fig. 2.15.
 - (b) With the Cassette Holder open, press the Reverse-Play button. Adjust VR823 on the Auto Azimuth P.C.B. Ass'y so that the Alignment Indicator coincides with the Pointer in the Azimuth Alignment Motor Ass'y.
- (3) **Playback Head Azimuth Alignment**
 - (a) Disconnect the Azimuth Motor by pulling out the connector CN-5 of the Auto Azimuth P.C.B. Ass'y.
 - (b) Load a 15 kHz Azimuth Alignment Tape (DA09004B) and set the cassette deck in Forward-Play mode.
 - (c) Turn the PH Azimuth Alignment screw until the outputs of both channels become maximum on the VTVM.
- (4) **Phase Adjustment and Record Head Height Adjustment and Azimuth Alignment**
 - (a) Connect a DC millivoltmeter to pin 1 of CN-5 on the Auto Azimuth P.C.B. Ass'y (CN-5 is removed).
 - (b) Load a 15 kHz Azimuth Alignment Tape (DA09004B) and set the cassette deck in Forward-Play mode. Adjust the VR701 on the Main P.C.B. Ass'y to obtain 0 V on the DC millivoltmeter. (Adjustment should be carried out within approx. 10 seconds.)
 - (c) Turn the Azimuth Alignment Tape upside down and set the cassette deck in Reverse-Play mode. Adjust VR702 on the Main P.C.B. Ass'y to obtain 0 V on the DC millivoltmeter within approx. 10 seconds.
 - (d) Load a Reference ZX Tape (DA09037B) and set the cassette deck in Rec./Forward-Play mode.
 - (e) Press the Level Calibration button to oscillate 400 Hz (0 dB) and turn the RH Height Gear until the outputs of both channels become maximum on the VTVM.
 - (f) Press the Bias Calibration button to oscillate 15 kHz (-20 dB) and turn the RH Azimuth Alignment Screw until the outputs of both channels become maximum on the VTVM.
 - (g) Feed in 5 kHz (-20 dB) from an external generator. Set the cassette deck in Rec./Forward-Play mode and adjust VR822 on the Auto Azimuth P.C.B. Ass'y to obtain the closest value to 0 V on the DC millivoltmeter at pin 1 of CN-5. (Adjustment should be done within approx. 10 seconds.)
 - (h) Mount CN-5 on the original place.
 - (i) Load a 15 kHz Azimuth Alignment Tape (DA09004B) and set the cassette deck in Forward-Play mode. Note the Indicator swing from the Pointer. Turn the Azimuth Alignment Tape upside down, set the cassette deck in Reverse-Play mode and note the Indicator swing from the Pointer. (Indicator will move in the opposite direction as above.) Adjust the PH Azimuth Alignment Screw so that the Pointer swings evenly in Forward-Play and Reverse-Play modes.
 - (j) Load a 15 kHz Azimuth Alignment Tape (DA09004B) and set the cassette deck in Forward-Play mode. Pull out CN-5 of the Auto Azimuth P.C.B. Ass'y after the Direction Indicator has been finished flashing.
 - (k) Press the Bias Calibration button to oscillate 15 kHz (-20 dB) and turn the RH Azimuth Alignment Screw until the outputs of both channels become maximum on the VTVM.
 - (l) Mount CN-5 on the original place.

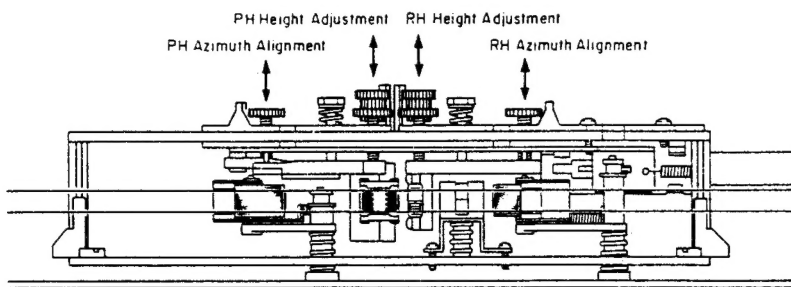


Fig. 2.14

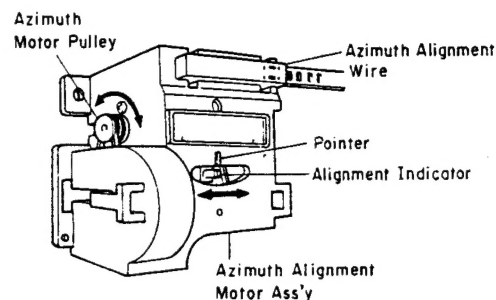


Fig. 2.15

2.9. Record Head Stroke Adjustment

Refer to Figs. 2.16 and 2.17.

Note: This adjustment will be required only to insure freedom from misalignment of the record head stroke in the record head stroke check mode.

- (1) Check the accuracy of the record head stroke.
- (2) Remove Head Mount Base Ass'y.
- (3) Remove the record head assembly.
- (4) Adjustment of Record Head Mounting Gauge M-9048 (DA0-9048A)
 - (a) Mount the Block B onto the Mounting Gauge Plate.
 - (b) Loosen the 2 screws fixing the Block A.
 - (c) As shown in Fig. 2.16, hold the Gauges (3.05 mm and 0.1 mm thickness) between the Block A and Block B, and fix the Block A with screws, pushing the Block A to the 2 guide pins.
- (5) Remove the Block B from the Mounting Gauge Plate.
- (6) As shown in Fig. 2.17, mount the R-8L record head assembly onto the Mounting Gauge Plate, then check the location of the R-8L record head surface. (If record head touches the Block C, loosen 2 pcs. of screws that assemble record head and record head plate, then place the R-8L record head assembly onto the Plate.)
- (7) Remove the R-8L record head assembly from the Mounting Gauge Plate.
- (8) Readjustment of Record Head Mounting Gauge M-9048 (DA09048A)
 - (a) Mount the Block B onto the Mounting Gauge Plate.
 - (b) Loosen the 2 screws fixing the Block A.
 - (c) As shown in Fig. 2.16, hold the Gauges (3.05 mm and either one of 0.05, 0.15, 0.2, 0.25, 0.3 or 0.35 mm thickness) between the Block A and Block B, and fix the Block A with screws, pushing the Block A to the 2 guide pins.
- (9) Remove the Block B from the Mounting Gauge Plate.
- (10) Mount the R-8L record head assembly onto the Mounting Gauge Plate.
- (11) As shown in Fig. 2.17, loosen 2 pcs. of screws that assemble record head and record head plate.

As the location of the Block A is secured by the item (8)-(c), push the record head to the directions A and B, then tighten 2 pcs. of screws.
- (12) Check to insure freedom from gap between the Block C and record head surface, then tighten the 2 pcs. of screws on the record head assembly with lock tight paint.
- (13) Remove the R-8L record head assembly from the Mounting Gauge Plate.
- (14) Assemble the record head assembly to the head mount base assembly.
- (15) Assemble the head mount base assembly to the mechanism assembly.
- (16) Check the record head stroke.

If the above are inaccurate, items (1) through (16) will have to be repeated till satisfactory results are obtained.

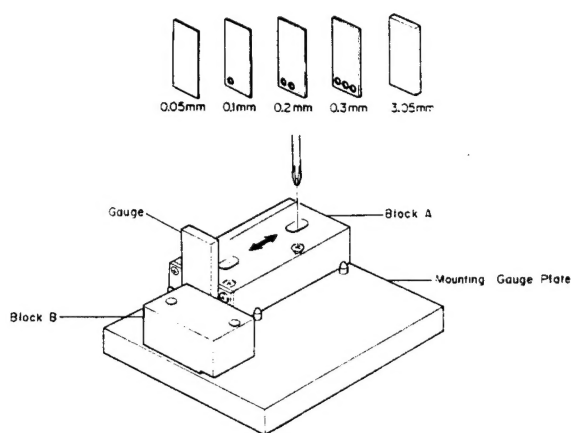


Fig. 2.16

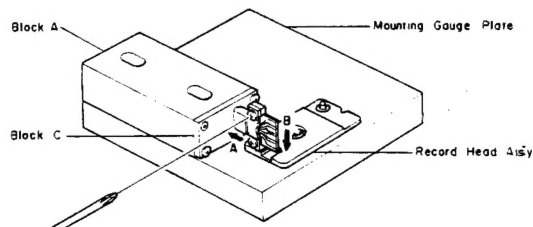


Fig. 2.17

2.10. Tape Travelling Adjustment

The adjustment shall be made with a modified version of the current type EXII C-90 as shown in Fig. 2.18 (error will be made if a current type Tape Travelling Cassette (DA09011A) should be used for this purpose).

While modifying an EXII C-90, the tape guides in the cassette housing shall be kept protected to avoid tilt.

Check shall be made in the following procedures.

- (1) An EXII C-90 tape thus modified shall be loaded onto the cassette deck.
- (2) Release the back-tension (rotate the Supply Reel and feed out some length of tape) and set the cassette deck in Play mode.
- (3) In this juncture, check to insure whether the tape is free from waving or slippage from the tape guide.
- (4) When the modified EXII C-90 is played back, check to insure whether the tape is freedom from waving from head surface or at pressure rollers.
- (5) If either of waving or slippage from the tape guide should be noted, adjustments of items 2.3 to 2.9, etc. will be required.

As a case may be, the said waving or slippage may have been caused from defective Supply Pressure Roller Ass'y or Take-up Pressure Roller Ass'y without parallel contact with capstans. If such are noted, the Pressure Roller Assemblies will have to be replaced.

Further, excessively weak take-up torque or strong take-up torque may cause defective tape travelling.

The cassette deck is intended to be an adjustment-free model, however if the similar matters as above should be noted, please replace the Reel Hub Ass'y to obtain appropriate take-up torque.

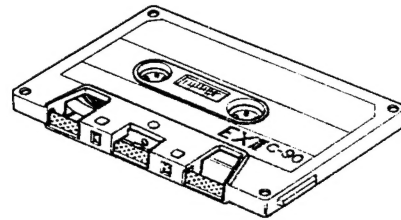


Fig. 2.18

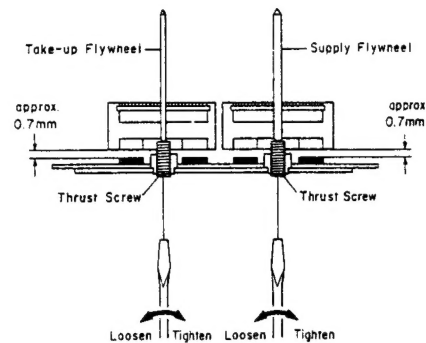


Fig. 2.19

2.11. Flywheel Ass'y Height Adjustment

Refer to Fig. 2.19.

- (1) Adjust both Thrust Screws so that the gaps between the Motor Coil Assemblies and the Flywheel Assemblies become approx. 0.7 mm.
- (2) Connect a synchroscope to CN501-1 (take-up side) and CN502-1 (supply side) on the Motor Control P.C.B. Ass'y. Set the synchroscope to AC input.
- (3) Check to insure that the peak-to-peak levels of both waveforms are greater than 20 mV.
- (4) Apply a quantity of lock tight paint to the Thrust Screws.

Note: Mount washers on the Flywheel Ass'y as follows if Flywheel Ass'y is replaced.

- (a) Turn the Thrust Screw so that the gap between the Motor Coil Ass'y and the Flywheel Ass'y becomes approx. 1 mm.
- (b) From the front side of the cassette deck, first insert a Washer 3.1 mm FT into the capstan shaft of supply side (Washer 2.6 mm FT for take-up side), then insert a Washer 3 mm (Washer 2.5 mm) into the shaft and press it until the Washer 3.1 mm FT (Washer 2.6 mm FT) contacts with the flange sufficiently. Refer to Fig. 5.5.
- (c) Perform the "Flywheel Ass'y Height Adjustment" in item 2.11.

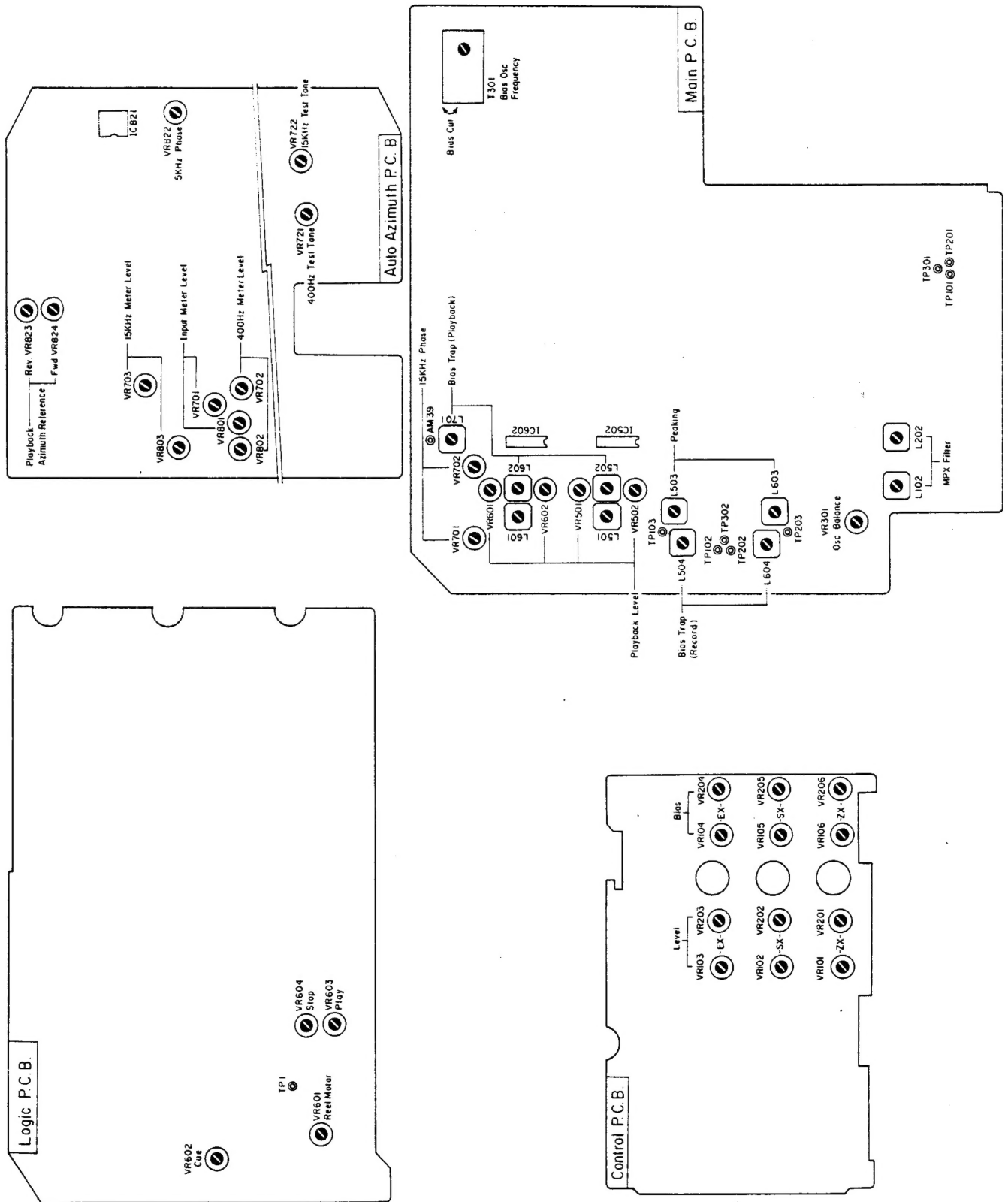
2.12. Lubrication

This is a lubrication-free cassette deck except when parts are replaced. Apply the following lubricant for each replaced part:

- (1) LAUNA #100
Capstan Shaft
Pressure Roller Shaft
Thrust Cap
- (2) FLOIL GB-TS-1
Reel Hub Shaft
Thrust portion on the Capstan Shaft
FLOIL GB-TS-1, made by Kanto Chemicals Co., Ltd. in Japan.
We suggest that you use the above or equivalent type. If unavailable please contact Kanto Chemicals Co., Ltd., 2-7 Kanda Suda-cho Chiyoda-ku, Tokyo 101 Japan.
- (3) Silicon Oil #3000 CST
Air Damper Piston

Note: Excessive lubrication may cause defective damper action as the 0.2 ϕ hole at the end of the cylinder may be filled with oil.

3. PARTS LOCATION FOR ELECTRICAL ADJUSTMENT



4. ELECTRICAL ADJUSTMENTS AND MEASUREMENTS

Note: Electrical adjustment should be performed after mechanical adjustment is completed.

4.1. Adjustment and Measurement Instructions

STEP	ITEM	SIGNAL SOURCE	OUTPUT CONNECTION	MODE	ADJUSTMENT	REMARKS
1	Tone Level Calibration	Tone 400 Hz and 15 kHz	VTVM to TP101, TP201 on Main P.C.B. and Output Jacks	Tone — 400 Hz/15 kHz Monitor SW — Source	Auto Azimuth P.C.B. VR721 (400 Hz) VR722 (15 kHz) Main P.C.B. VR301 (400 Hz Balance)	<ol style="list-style-type: none"> 1. Press the Level Calibration button to oscillate 400 Hz. 2. Adjust VR721 to obtain 350 mV on the VTVM at TP101 (L ch). 3. Adjust VR301 to obtain the same level as L ch at TP201. 4. Measure the reading on the VTVM at the Output Jacks. 5. Press the Bias Calibration button to oscillate 15 kHz. 6. Adjust VR722 to obtain 20 dB lower level than in 4 on the VTVM at the Output Jacks. 7. Press the Calibration Reset button to stop the tone oscillation.
2	Meter Level Calibration	400 Hz to Input Jacks and Tone 400 Hz and 15 kHz	VTVM to TP101, TP201 on Main P.C.B.	Tone — OFF/400 Hz/15 kHz Monitor SW — Source	Auto Azimuth P.C.B. VR701, VR801 VR702, VR802 VR703, VR803 VR721 (400 Hz) VR722 (15 kHz)	<ol style="list-style-type: none"> 1. Feed in 400 Hz, then adjust the Input level controls to obtain 350 mV —0.9 dB on the VTVM. 2. Adjust VR701 (VR801) so that the 0 dB segment of the level meter starts illuminating. 3. Press the Level Calibration button to oscillate 400 Hz, then adjust VR721 to obtain 350 mV —0.25 dB on the VTVM. 4. Adjust VR702 (VR802) so that the 0 dB segment of the level meter starts illuminating. 5. Press the Bias Calibration button to oscillate 15 kHz, then adjust VR722 to obtain 35 mV —0.25 dB on the VTVM. 6. Adjust VR703 (VR803) so that the 0 dB segment of the level meter starts illuminating. 7. Press the Calibration Reset button. 8. Re-adjust the tone level according to step 1 "Tone Level Calibration".
3	MPX Filter Adjustment	19 kHz \pm 100 Hz to Input Jacks	VTVM to Output Jacks	Monitor SW — Source Dolby NR SW — OFF MPX SW — ON	Main P.C.B. L102, L202	<ol style="list-style-type: none"> 1. Turn the Output level control fully clockwise (maximum position). 2. Adjust the Input Level controls to obtain 1 V on the VTVM. 3. Set the MPX Filter switch to ON, then adjust L102 (L202) to obtain the minimum reading on the VTVM (the minimum reading will be less than —30 dB).
4	Playback Head and Record Head Height Adjustment and Azimuth Alignment	1 kHz Track Alignment Tape (DA09007B) 15 kHz Azimuth Tape (DA09004B) 5 kHz (—20 dB) to Input Jacks Tone 15 kHz	VTVM to Output Jacks and DC Millivoltmeter to pin 1 of CN-5 on Auto Azimuth P.C.B.	Playback (Fwd./Rev.) Record, Playback (Fwd.) Monitor SW — Tape Tape SW — ZX Eq. SW — 70 μ s Dolby NR SW — OFF MPX SW — OFF	PH Height Gear PH Azimuth Alignment Screw RH Height Gear RH Azimuth Alignment Screw Auto Azimuth P.C.B. (Fwd. Azimuth Ref.) VR824 (Rev. Azimuth Ref.) VR823 (5 kHz Phase) VR822 Main P.C.B. (15 kHz Fwd. Phase) VR701 (15 kHz Rev. Phase) VR702	Perform the following adjustments successively. <ol style="list-style-type: none"> 1. Playback Head Height Adjustment <ol style="list-style-type: none"> a. Load a 1 kHz track alignment tape (DA09007B) and forward-play it back. b. Adjust the PH Height Gear to obtain minimum readings of both channels on the VTVM. 2. Azimuth Reference Position Adjustment <ol style="list-style-type: none"> a. With the Cassette Holder open, press the Forward-Play button. Adjust VR824 on the Auto Azimuth P.C.B. Ass'y so that the Alignment Indicator coincides with the Pointer in the Azimuth Alignment Motor Ass'y. Refer to Fig. 2.15. b. With the Cassette Holder open, press the Reverse-Play button. Adjust VR823 on the Auto Azimuth P.C.B. Ass'y so that the Alignment Indicator coincides with the Pointer in the Azimuth Alignment Motor Ass'y. 3. Playback Head Azimuth Alignment <ol style="list-style-type: none"> a. Disconnect the Azimuth Motor by pulling out the connector CN-5 of the Auto Azimuth P.C.B. Ass'y. b. Load a 15 kHz azimuth tape (DA09004B) and forward-play it back. c. Adjust the PH Azimuth Alignment Screw to obtain maximum readings of both channels on the VTVM. 4. Phase Adjustment and Record Head Height Adjustment and Azimuth Alignment <ol style="list-style-type: none"> a. Disconnect CN-5 of the Auto Azimuth P.C.B. Ass'y. b. Load a 15 kHz azimuth tape (DA09004B) and forward-play it back. Adjust VR701 on the Main P.C.B. Ass'y to obtain 0 V on the DC millivoltmeter. (Adjustment should be carried out within approx. 10 seconds.) (to be continued)

STEP	ITEM	SIGNAL SOURCE	OUTPUT CONNECTION	MODE	ADJUSTMENT	REMARKS
4 (continued)						<p>c. Turn the azimuth tape upside down and reverse-play it back. Adjust VR702 on the Main P.C.B. Ass'y to obtain 0 V on the DC millivoltmeter within approx. 10 seconds.</p> <p>d. Load a reference ZX tape (DA09037B) and record/forward-play it back.</p> <p>e. Press the Level Calibration button to oscillate 400 Hz (0 dB) and adjust the RH Height Gear to obtain maximum readings of both channels on the VTVM.</p> <p>f. Press the Bias Calibration button to oscillate 15 kHz (-20 dB) and adjust the RH Azimuth Alignment Screw to obtain maximum readings of both channels on the VTVM.</p> <p>g. Feed in 5 kHz (-20 dB) from an external generator and record/forward-play it back. Adjust VR822 on the Auto Azimuth P.C.B. Ass'y to obtain the closest value to 0 V on the DC millivoltmeter. (Adjustment should be done within approx. 10 seconds.)</p> <p>h. Mount CN-5 on the original place.</p> <p>i. Load a 15 kHz azimuth tape (DA09004B) and forward-play it back. Note the Indicator swing from the Pointer. Turn the azimuth tape upside down, reverse-play it back and note the Indicator swing from the Pointer. (Indicator will move in the opposite direction as above.) Adjust the PH Azimuth Alignment Screw so that the Pointer swings evenly in Forward-Play and Reverse-Play modes.</p> <p>j. Load a 15 kHz azimuth tape (DA09004B) and forward-play it back. Pull out CN-5 of the Auto Azimuth P.C.B. Ass'y after the Direction Indicator has been finished flashing.</p> <p>k. Press the Bias Calibration button to oscillate 15 kHz (-20 dB) and adjust the RH Azimuth Alignment Screw to obtain maximum readings of both channels on the VTVM.</p> <p>l. Mount CN-5 on the original place.</p>
5	Playback Level Calibration	400 Hz Level Tape (DA09005B)	VTVM to TP101, TP201 on Main P.C.B.	Playback (Fwd./Rev.) Monitor SW - Tape Eq. SW - 70 μ s Dolby NR SW - OFF MPX SW - OFF	Main P.C.B. VR501, VR601 (Fwd.) VR502, VR602 (Rev.)	<p>1. Load a 400 Hz level tape and forward-play it back.</p> <p>2. Adjust VR501 (VR601) to obtain 350 mV on the VTVM.</p> <p>3. Turn the tape upside down and reverse-play it back.</p> <p>4. Adjust VR502 (VR602) to obtain 350 mV on the VTVM.</p>
6	Playback Frequency Response Adjustment	400 Hz Level Tape (DA09005B) 10 kHz PB Frequency Response Tape (DA09003B) 15 kHz PB Frequency Response Tape (DA09002B) 20 kHz PB Frequency Response Tape (DA09001B)	VTVM to Output Jacks	Playback (Fwd./Rev.) Monitor SW - Tape Tape SW - SX Eq. SW - 70 μ s Dolby NR SW - OFF MPX SW - OFF	Main P.C.B. (Fwd.) R507, R607 R508, R608 (Rev.) R517, R617 R518, R618	<p>1. Load a 400 Hz level tape and forward-play it back. Adjust the Output level control to a certain level (0 dB for example).</p> <p>2. Load 10 kHz, 15 kHz and 20 kHz PB frequency response tapes and forward-play them back. Short R507 (R607) or R508 (R608) to obtain the following levels against the level for the 400 Hz level tape. 10 kHz: -20 dB -1 dB to +2 dB 15 kHz: -20 dB -1 dB to +3 dB 20 kHz: -20 dB -1 dB to +4 dB</p> <p>3. Turn the tape upside down and reverse-play them back. Short R517 (R617) or R518 (R618) to obtain the levels which suffice the range specified in above 2.</p> <p>4. Refer to the "Playback Frequency Response Adjustment" in item 4.2 for the detailed description.</p>
7	Bias Oscillation Frequency and Erase Current Adjustment		VTVM across the additional 0.1 Ω resistor and Frequency Counter to CN1-1 on Main P.C.B.	Record, Pause Monitor SW - Source Tape SW - ZX Eq. SW - 70 μ s Dolby NR SW - OFF MPX SW - OFF	Main P.C.B. T301 R313, R314	<p>1. Connect an additional 0.1 Ω resistor in series to the Erase Head, then connect a VTVM across it.</p> <p>2. Adjust T301 to obtain 105 kHz on the frequency counter.</p> <p>3. Check the erase current by the VTVM. Erase current will be in a range of 310 mA to 400 mA (typically approx. 350 mA). If erase current is not sufficient increase it by shorting R313 or R314.</p> <p>4. After completion of the erase current adjustment, re-check the bias oscillation frequency.</p> <p>5. Remove the additional 0.1 Ω resistor.</p>

STEP	ITEM	SIGNAL SOURCE	OUTPUT CONNECTION	MODE	ADJUSTMENT	REMARKS
8	Record Amplifier Equalizer Adjustment	23 kHz (-20 dB) to Input Jacks	VTVM to TP102, TP202 on Main P.C.B.	Record, Pause Monitor SW — Source Tape SW — ZX Eq. SW — 70 μ s Dolby NR SW — OFF MPX SW — OFF	Main P.C.B. L503, L603	1. Remove the bias-cut jumper from the dip side of the Main P.C.B. Ass'y. 2. Adjust L503 (L603) to obtain approx. +16 dB at 23 kHz on the VTVM. 3. Re-solder the bias-cut jumper.
9	Bias Trap Adjustment (Record Amp.)	Remove input signals	VTVM to TP103, TP203 on Main P.C.B.	Same as above	Main P.C.B. L504, L604	Adjust L504 (L604) to obtain minimum reading on the VTVM.
10	Bias Trap Adjustment (Playback Amp.)	Remove input signals	VTVM to IC502-3, IC602-3 (Fwd. Playback Amp.), IC502-1, IC602-1 (Rev. Playback Amp.) and AM39 (Sub Playback Amp.)	Same as above	Main P.C.B. L501, L502 L601, L602 L701	1. Adjust L501 (L601) to obtain minimum reading on the VTVM at IC502-3 (IC602-3). 2. Adjust L502 (L602) to obtain minimum reading on the VTVM at IC502-1 (IC602-1). 3. Adjust L701 to obtain minimum reading on the VTVM at terminal AM39.
11	Record Level Calibration and Recording Bias Current Adjustment	Tone 400 Hz and 15 kHz and 10 kHz/20 kHz (-20 dB) to Input Jacks	VTVM and Distortion Meter to Output Jacks	Record, Playback (Fwd.) Tone — 400 Hz/15 kHz Monitor SW — Tape Tape SW — ZX/SX EX Eq. SW — 70 μ s (ZX/SX) 120 μ s (EX) Dolby NR SW — C-Type/B-Type/OFF MPX SW — OFF	Control P.C.B. (Level) ZX: VR101, VR201 SX: VR102, VR202 EX: VR103, VR203 (Bias) ZX: VR106, VR206 SX: VR105, VR205 EX: VR104, VR204	Adjustment should be made in the order of ZX, SX and EX. 1. Set the Dolby NR switch to C-Type. 2. Load a reference ZX tape (DA09037B), reference SX tape (DA09025B) and reference EXII tape (DA09066B). 3. Adjust the Sensitivity controls VR101 (VR201) for ZX, VR102 (VR202) for SX and VR103 (VR203) for EXII to maximum position. 4. Adjust the Bias controls VR106 (VR206) for ZX, VR105 (VR205) for SX and VR104 (VR204) for EXII to maximum position. 5. Press the Record and Fwd. Play buttons, then press the Level Calibration button to oscillate 400 Hz. 6. Adjust the Sensitivity controls VR101 (VR201), VR102 (VR202) and VR103 (VR203) to obtain 0 dB on the level meters. 7. Press the Bias Calibration button to oscillate 15 kHz. 8. Adjust the Bias controls VR106 (VR206), VR105 (VR205) and VR104 (VR204) to obtain 0 dB on the level meters. 9. Repeat 5 to 8 as above two or three times to obtain optimum performance. 10. Set the Dolby NR switch to B-Type/OFF. 11. Feed in 10 kHz (-20 dB) and 20 kHz (-20 dB), then record and forward-play them back. Check to insure that the levels are within -20 dB \pm 2 dB against the levels in Dolby NR C-Type. 12. Check to insure whether the total harmonic distortion is less than 0.8% for ZX tape and 1.0% for SX and EXII tapes.
12	Overall Frequency Response Adjustment	400 Hz (0 dB) and 20 Hz to 20 kHz (-20 dB) to Input Jacks	VTVM to Output Jacks	Record, Playback (Fwd.) Monitor SW — Source/Tape Tape SW — ZX/SX/EX Eq. SW — 70 μ s (ZX/SX) 120 μ s (EX) Dolby NR SW — OFF MPX SW — OFF	Main P.C.B. L503, L603	1. Set the Monitor switch to Source. 2. Feed in 400 Hz (0 dB) and adjust the input level controls to obtain 0 dB on the level meters. 3. Switch the Generator output level to -20 dB. 4. Set the Monitor switch to Tape, then record and forward-play it back. 5. Feed in 20 Hz to 20 kHz (-20 dB), and check to insure whether the output levels are within -20 dB \pm 3 dB. 6. If above is not sufficient, adjust L503 (L603) to obtain approx. -20 dB on the VTVM at 20 kHz. 7. Conduct step 11 "Record Level Calibration and Recording Bias Current Adjustment". 8. If above is not sufficient further, precise re-adjustment of step 6 "Playback Frequency Response", replacement of Playback Head or Record Head, check on item 2.10 "Tape Travelling Adjustment" or frequency response adjustment according to item 4.2 will be required.
13	Crosstalk Measurement	1 kHz to Input Jacks	1 kHz Band Pass Filter and VTVM to Output Jacks	Record and Playback (Fwd.) Monitor SW — Tape Tape SW — ZX Eq. SW — 70 μ s Dolby NR SW — OFF		1. Erase a reference ZX tape with a bulk eraser. 2. Load the reference tape and adjust the input level controls to obtain 0 dB on the level meters. 3. Record input signals on the tape with pressing the Record and Fwd. Play buttons. 4. Press the Stop button, then reverse-play it back with pressing Rev. Play button. 5. Measure the difference between 3 and 4. (to be continued)

STEP	ITEM	SIGNAL SOURCE	OUTPUT CONNECTION	MODE	ADJUSTMENT	REMARKS
13 (continued)						6. Record input signals on the tape but not on the portion used as above. 7. Turn the tape the other way round and forward-play it back. 8. Measure the output level difference between 6 and 7.
14	Channel Separation Measurement	1 kHz to Input Jacks	1 kHz Band Pass Filter and VTVM to Output Jacks	Record and Playback (Fwd.) Monitor SW — Tape Tape SW — ZX Eq. SW — 70 μ s Dolby NR SW — OFF		1. Erase a reference ZX tape with a bulk eraser. 2. Load the reference tape and adjust the L ch (R ch) Input level control to obtain 0 dB on the level meter. Close the R ch (L ch) Input level control. 3. Record and forward-play the input signals and measure the R ch (L ch) level on the VTVM. 4. Turn the tape the other way round and reverse-play it back. 5. Measure the R ch (L ch) level on the VTVM.
15	Signal to Noise Ratio Measurement	400 Hz to Input Jacks	VTVM and Distortion Meter to Output Jacks	Record and Playback (Fwd.) Monitor SW — Tape Tape SW — ZX Eq. SW — 70 μ s Dolby NR SW — B-Type/C-Type		1. Feed in 400 Hz and record and forward-play it back. 2. Adjust the Input level controls to obtain a 3% total harmonic distortion in Playback mode. 3. Close the Input level controls, then record again. After rewind, forward-play back and check the output level difference between 3 and 4. Note: The filter of IHF-A curve shall be used in the measurements.
16	Total Harmonic Distortion Measurement	400 Hz to Input Jacks	Distortion Meter to Output Jacks	Record and Playback (Fwd.) Monitor SW — Tape Tape SW — ZX/SX/EX Eq. SW — 70 μ s (ZX/SX) 120 μ s (EX) Dolby NR SW — OFF		1. Adjust the Input level controls to obtain 0 dB on the level meters. 2. Record and forward-play it back. 3. Read the distortion meter and check to insure that the distortion is less than 0.8% for ZX tape and 1.0% for SX and EXII tapes.
17	Wow/Flutter & Speed Measurement	3 kHz Speed and Wow/Flutter Tape (DA09006C)	Wow/Flutter Meter to Output Jacks	Playback Monitor SW — Tape Eq. SW — 70 μ s		Forward-play back and read the wow/flutter meter.

4.2. Frequency Response Adjustment

(1) Playback Frequency Response Adjustment

Refer to Figs. 4.2.1 and 4.2.2.

Peaking adjustment will be required if playback level is not sufficient when 20 kHz PB frequency response tape is played back as referred to step 6 in 4.1 "Adjustment and Measurement Instructions".

The adjustment will compensate the gap loss of the playback head.

Peaking level is varied by the short circuit of the following resistors in the playback amp. circuit of the Main P.C.B. Ass'y.

Forward Playback Amp.:

R507, R607 (220 ohms) or R508, R608 (470 ohms)

Reverse Playback Amp.:

R517, R617 (220 ohms) or R518, R618 (470 ohms)

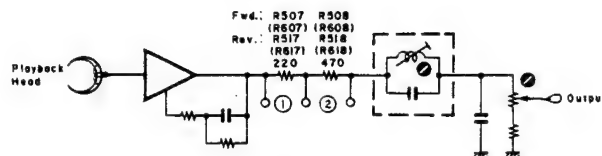


Fig. 4.2.1

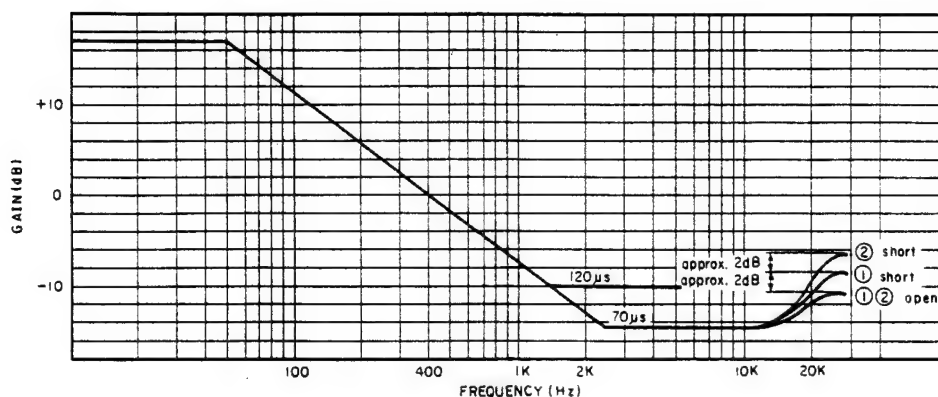


Fig. 4.2.2

(2) Record Current Frequency Response Adjustment

Record eq. peaking is adjusted for compensating the overall frequency response when playback frequency response is completed.

Normally however peaking frequency is pre-adjusted to approx. 23 kHz in Record mode. Refer to Fig. 4.2.3.

(a) For ZX Tape

- 1) Feed in 400 Hz (0 dB), then record and play it back. Adjust bias current by VR106 (VR206) on the Control P.C.B. Ass'y to obtain 0.8% distortion.
- 2) Feed in 10 kHz and 400 Hz (-20 dB), then record and play them back. Check the difference of the levels between 10 kHz and 400 Hz, and mount an additional capacitor in parallel with C126 (C226) on the Main P.C.B. Ass'y from the dip side of the printed circuit board depending upon the difference of the levels against 400 Hz. Refer to Fig. 4.2.4.

Level Difference	Addition	Total
0 dB	0	820 pF
-1 dB	220 pF	1040 pF

- 3) Feed in 22 kHz (-20 dB), then record and play it back. Adjust record peaking coil L503 (L603) on the Main P.C.B. Ass'y to obtain flat overall frequency response.

(b) For SX Tape

- 1) Feed in 15 kHz and 400 Hz (-20 dB), then record and play them back. Adjust bias current by VR105 (VR205) on the Control P.C.B. Ass'y to obtain flat overall frequency response.
- 2) Feed in 20 kHz and 400 Hz (-20 dB), then record and play them back. And check to insure that the overall frequency response is flat.

(c) For EXII Tape

- 1) Feed in 15 kHz and 400 Hz (-20 dB), then record and play them back. Adjust bias current by VR104 (VR204) on the Control P.C.B. Ass'y to obtain flat overall frequency response.
- 2) Feed in 20 kHz and 400 Hz (-20 dB), then record and play them back. And check to insure that the overall frequency response is flat.

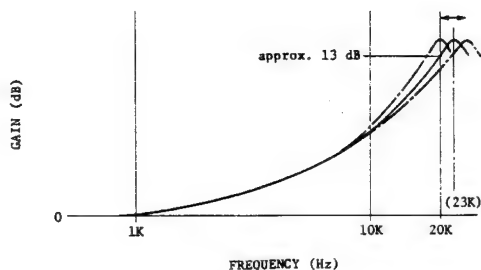


Fig. 4.2.3

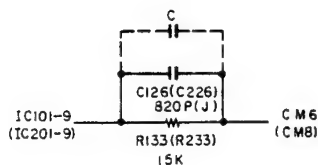


Fig. 4.2.4

4.3. Dolby NR Circuit Check

Dolby NR circuit incorporates Dolby NR ICs which have no adjustment point.

Perform the following checks and make sure that the IC operates accurately, i.e., accuracy of frequency response through IC.

4.3.1. Dolby NR B-Type Circuit Check

(1) Playback Dolby NR Circuit

Signal Source: 1.4 kHz to negative side of C131 (C231) on Main P.C.B.
Output Connection: VTVM to TP101 (TP201) on Main P.C.B.
Mode: Stop
Monitor SW — Tape
Dolby NR SW — B-Type/OFF

- (a) Connect a VTVM to TP101 (TP201) on the Main P.C.B. Ass'y.
- (b) Set the Dolby NR switch to B-Type. Feed in 1.4 kHz and adjust the generator output control to obtain 35 mV on the VTVM.
- (c) Set the Dolby NR switch to OFF. Check to insure that the reading is +3.2 dB \pm 1.5 dB on the VTVM.

(2) Record Dolby NR Circuit

Signal Source: 1.4 kHz to Input Jacks
Output Connection: VTVM to TP101 (TP201) and CM6 (CM8) on Main P.C.B.
Mode: Stop
Monitor SW — Source
Dolby NR SW — B-Type/OFF

- (a) Connect a VTVM to TP101 (TP201) on the Main P.C.B. Ass'y.
- (b) Feed in 1.4 kHz and adjust the Input Level controls to obtain 35 mV/11.1 mV on the VTVM.
- (c) Remove the VTVM from TP101 (TP201) and reconnect it to CM6 (CM8) on the Main P.C.B. Ass'y.
- (d) Check to insure that the reading at CM6 (CM8) corresponds to the following with Dolby NR switch OFF and B-Type.

Input Level at TP101, TP201	Level at CM6, CM8	
	Dolby NR OFF	Dolby NR B-Type
35 mV	0 dB	+3.2 dB \pm 1.5 dB
11.1 mV	0 dB	+8.2 dB \pm 1.5 dB

4.3.2. Dolby NR C-Type Circuit Check

(1) Playback Dolby NR Circuit

Signal Source: 1.4 kHz to negative side of C131 (C231) on Main P.C.B.
Output Connection: VTVM to TP101 (TP201) on Main P.C.B.
Mode: Stop
Monitor SW — Tape
Dolby NR SW — C-Type/OFF

- (a) Connect a VTVM to TP101 (TP201) on the Main P.C.B. Ass'y.
- (b) Set the Dolby NR switch to C-Type. Feed in 1.4 kHz and adjust the generator output control to obtain 35 mV on the VTVM.
- (c) Set the Dolby NR switch to OFF. Check to insure that the reading is +6.5 dB \pm 1.5 dB on the VTVM.

(2) Record Dolby NR Circuit

Signal Source: 1.4 kHz to Input Jacks
Output Connection: VTVM to TP101 (TP201) and CM6 (CM8) on Main P.C.B.
Mode: Stop
Monitor SW — Source
Dolby NR SW — C-Type/OFF

- (a) Connect a VTVM to TP101 (TP201) on the Main P.C.B. Ass'y.
- (b) Feed in 1.4 kHz and adjust the Input Level controls to obtain 35 mV/11.1 mV on the VTVM.
- (c) Remove the VTVM from TP101 (TP201) and reconnect it to CM6 (CM8) on the Main P.C.B. Ass'y.
- (d) Check to insure that the reading at CM6 (CM8) corresponds to the following with Dolby NR switch OFF and C-Type.

Input Level at TP101, TP201	Level at CM6, CM8	
	Dolby NR OFF	Dolby NR C-Type
35 mV	0 dB	+6.5 dB \pm 1.5 dB
11.1 mV	0 dB	+11.4 dB \pm 1.5 dB

5. MECHANISM ASS'Y AND PARTS LIST

5.1. Synthesis

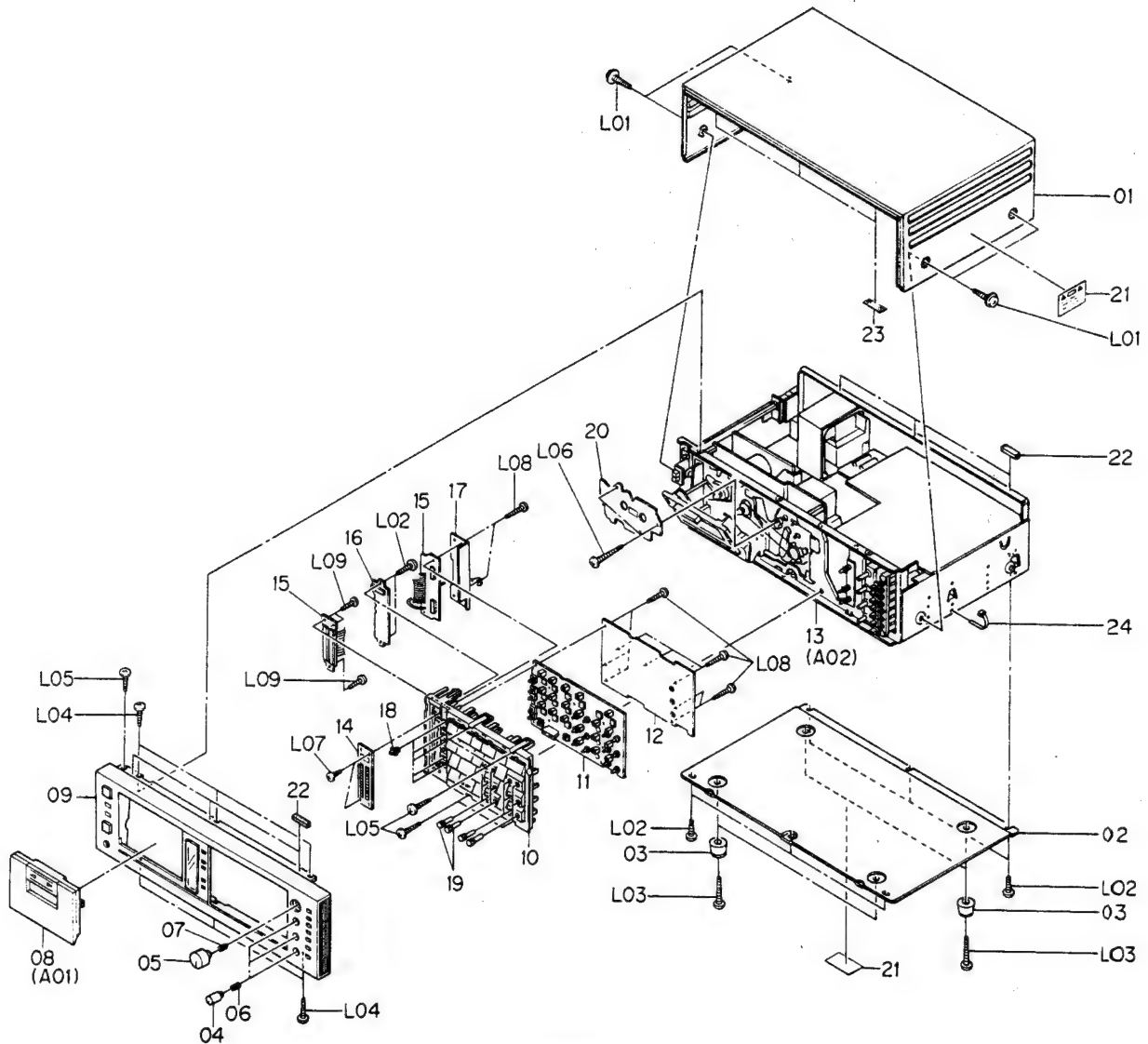


Fig. 5.1

Schematic Ref. No.	Part No.	Description	Q'ty	Schematic Ref. No.	Part No.	Description	Q'ty
	HA04393A	Synthesis (Japan)	1	14	0H04198A	Meter Cover	1
	HA04392A	Synthesis (U.S.A. & Canada)	1	15	BA04893A	Indicator P.C.B. Ass'y	1
	HA04396A	Synthesis (220V Class 2)	1	16	BA04894A	Counter P.C.B. Ass'y	1
	HA04391A	Synthesis (UK)	1	17	0J04698B	Shield Plate	1
	HA04395A	Synthesis (Australia)	1	18	0H04180A	Function Button	5
	HA04394A	Synthesis (Others)	1	19	0H04204A	Calibration Volume Knob	12
		Serial No.: A80101001 -		20	HA04422A	Cover Plate	1
01	0H04010A	Top Cover	1	21	0M04377A	Caution Label (U.S.A. & Canada)	2
02	0J04652A	Bottom Cover	1	22	0J04550A	Top Cover Cushion	6
03	0J03564A	Leg T-H	4	23	0J04080A	Top Cover Himelon	3
04	0H04203A	Volume Knob	3	24	0B08515A	Insu-Lock	1
05	0H04202A	Master Volume Knob	1	L01	0E03032A	BT 4x8 @ Pan (Washer Faced)	4
06	0H03737A	Volume Knob Base	3	L02	0E00857A	BT 3x6 @ Binding	8
07	0H03739A	Master Volume Knob Base	1	L03	0E00865A	BT 3x10 @ Binding	4
08	HA04401A	Cassette Lid Ass'y	1	L04	0E00921A	BT 3x8 @ Binding (Black Chromate)	6
09	HA04398A	Front Panel Ass'y	1	L05	0E00868A	BT 3x8 @ Binding	3
10	HA04399A	Front Panel Escutcheon Ass'y	1	L06	0E00950A	BT 3x14 @ Pan (Black Chromate)	2
11	BA04892A	Control P.C.B. Ass'y	1	L07	0E00869A	BT 2.6x4 @ Binding	2
12	0J04707A	Insulator	1	L08	0E00954A	BT 2.6x8 @ Binding	10
13	JA03971A	Chassis Ass'y (Japan)	1	L09	0E00859A	BT 2.6x6 @ Binding	3
	JA03970A	Chassis Ass'y (U.S.A. & Canada)	1				
	JA03974A	Chassis Ass'y (220V Class 2)	1				
	JA03969A	Chassis Ass'y (UK)	1				
	JA03973A	Chassis Ass'y (Australia)	1				
	JA03972A	Chassis Ass'y (Others)	1				

5.2. Cassette Lid Ass'y (A01)

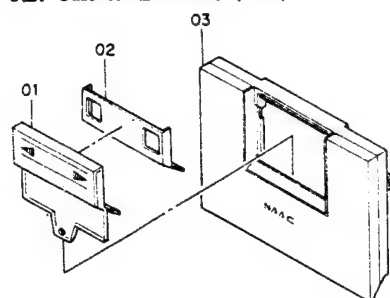


Fig. 5.2

5.3. Chassis Ass'y (A02)

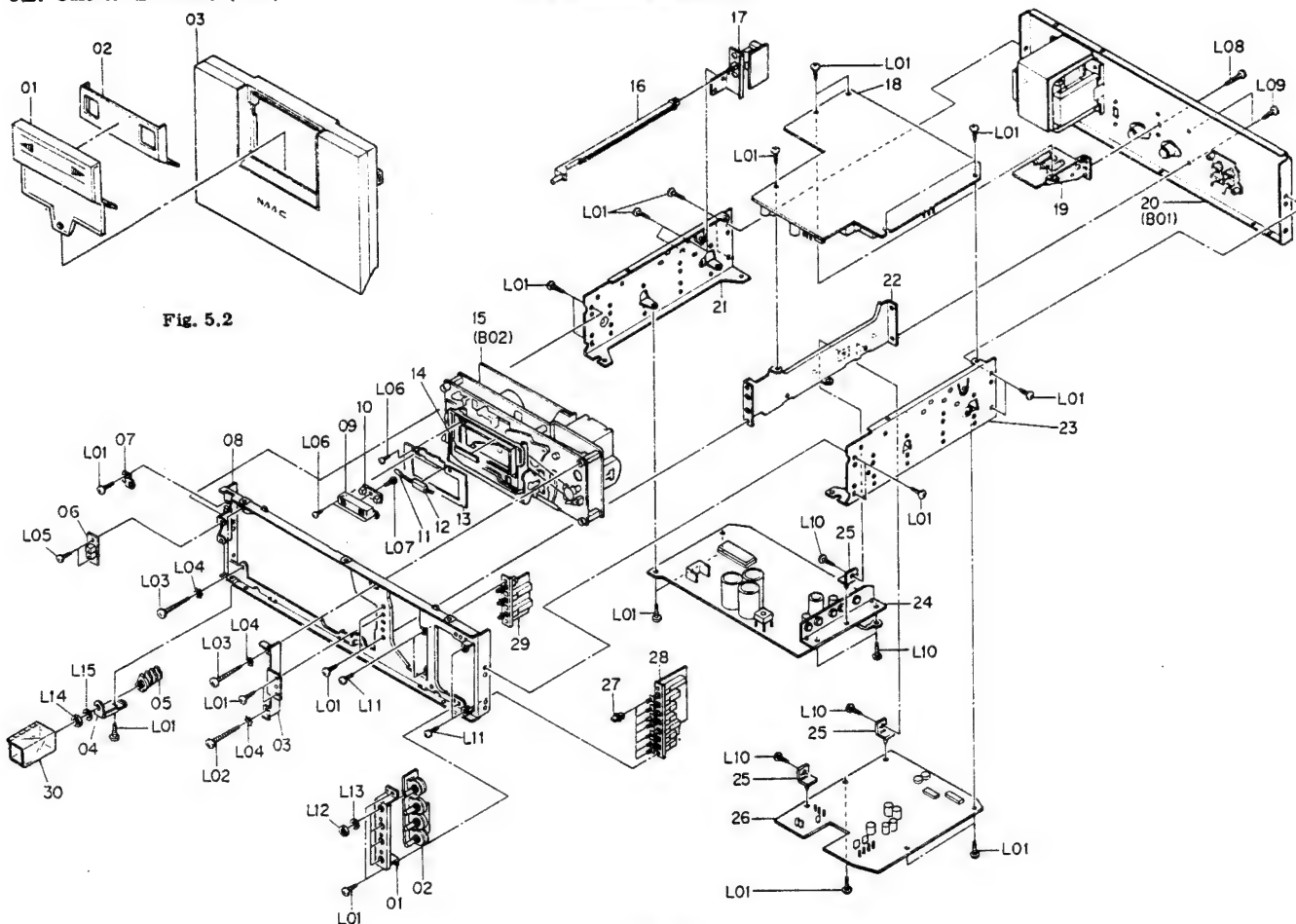


Fig. 5.3

Schematic Ref. No.	Part No.	Description	Q'ty	Schematic Ref. No.	Part No.	Description	Q'ty
A01	HA04401A	Cassette Lid Ass'y Serial No.: A80101001 -	1	18	BA04870A	Main P.C.B. Ass'y	1
01	OH04189A	Lid Cover	1	19	BA04899A	Fuse P.C.B. Ass'y (U.S.A., Canada & Others)	1
02	OH04187A	Indicator Reflector	1		BA04900A	Fuse P.C.B. Ass'y (UK, 220V Class 2 & Australia)	1
03	HA04414A	Cassette Lid Sub Ass'y	1		BA04898A	Fuse P.C.B. Ass'y (Japan)	1
A02	JA03969A	Chassis Ass'y (UK)	1	20	HA04403A	Rear Panel Ass'y (UK)	1
	JA03970A	Chassis Ass'y (U.S.A. & Canada)	1		HA04408A	Rear Panel Ass'y (U.S.A. & Canada)	1
	JA03971A	Chassis Ass'y (Japan)	1		HA04404A	Rear Panel Ass'y (Japan)	1
	JA03972A	Chassis Ass'y (Others)	1		HA04405A	Rear Panel Ass'y (Others)	1
	JA03973A	Chassis Ass'y (Australia)	1		HA04406A	Rear Panel Ass'y (Australia)	1
	JA03974A	Chassis Ass'y (220V Class 2) Serial No.: A80101001 -	1		HA04407A	Rear Panel Ass'y (220V Class 2)	1
01	QJ04643A	Volume Holder	1	21	QJ04650A	Side Chassis L	1
02	BA04890A	Volume P.C.B. Ass'y	1	22	QJ04649A	Center Chassis	1
03	QJ04135A	Mechanism Bracket	1	23	QJ04651A	Side Chassis R	1
04	QJ04644A	Headphone Jack Holder	1	24	BA04886A	Logic P.C.B. Ass'y	1
05	OB08511A	Headphone Jack	1	25	OB08771A	Hinge	1
06	BA04897A	Timer Switch P.C.B. Ass'y	1	26	BA04879A	Auto Azimuth P.C.B. Ass'y	1
07	QJ04645A	Power Switch Bar Holder	1	27	OH04179A	Function Button A	7
08	QJ04648A	Front Chassis	1	28	BA04889A	Switch P.C.B. Ass'y	1
09	OH04186A	Indicator Cover	1	29	BA04891A	Tape Select P.C.B. Ass'y	1
10	BA04895A	Direction P.C.B. Ass'y	1	30	QJ04516A	Headphone Jack Cover	1
11	OB02228B	Lamp 14V 50mA	1	L01	OE00857A	BT 3x6 @ Binding (Chromate)	31
12	QJ04506C	Lamp Holder	1	L02	OE00924A	BT 4x16 @ Binding (Chromate)	1
13	QJ04637A	Cassette Case Plate	1	L03	OE00944A	BT 4x15 @ Binding (Black Chromate)	3
14	BA04896A	Connector P.C.B. Ass'y	1	L04	OE00078A	Washer 4mm Toothed Lock	4
15	CA08445A	Mechanism Ass'y	1	L05	OE03022A	BT 2x4 @ Binding (Black Chromate)	2
16	QJ04604B	Power Switch Bar	1	L06	OE00869A	BT 2x4 @ Binding (Chromate)	1
17	BA04947A	Power Switch P.C.B. Ass'y (U.S.A. & Canada)	1	L07	OE00873A	BT 2.6x5 @ Binding (Chromate)	1
	BA04948A	Power Switch P.C.B. Ass'y (UK, 220V Class 2, Australia & Others)	1	L08	OE00921A	BT 3x8 @ Binding (Black Chromate)	1
	BA04946A	Power Switch P.C.B. Ass'y (Japan)	1	L09	OE00860A	BT 3x6 @ Binding (Black Chromate)	2
				L10	OE00612A	M3x6 @ Pan	3

5.4. Rear Panel Ass'y (B01)

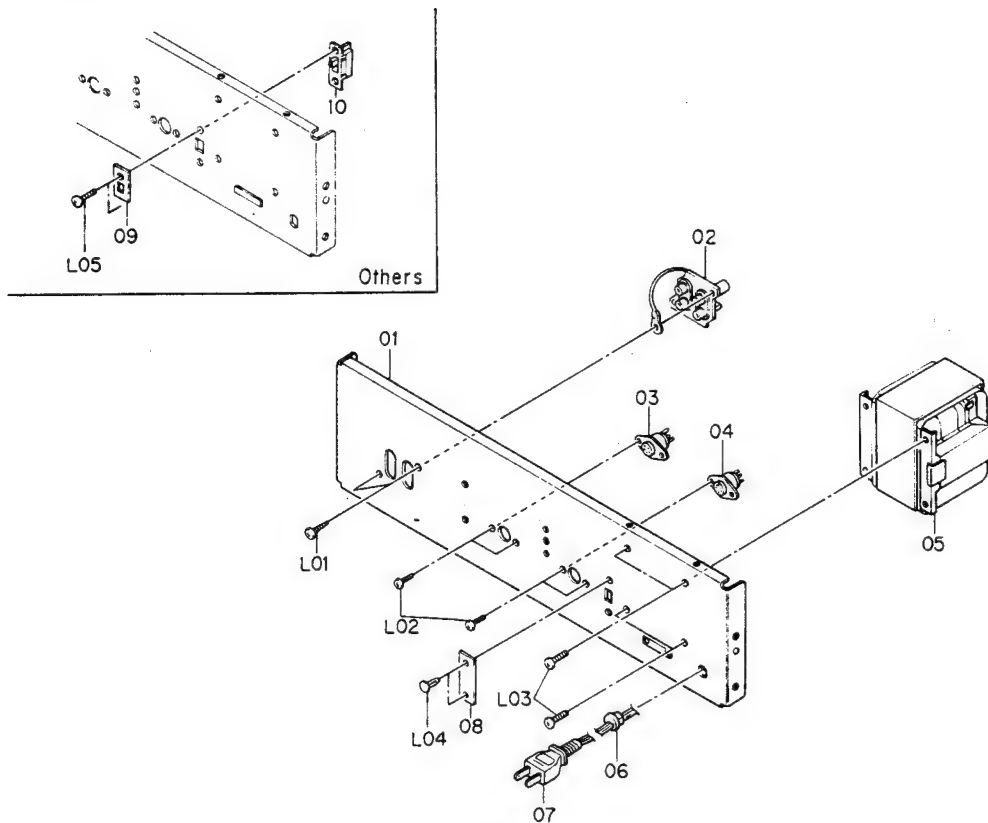


Fig. 5.4

Schematic Ref. No.	Part No.	Description	Q'ty	Schematic Ref. No.	Part No.	Description	Q'ty
B01	HA04408A	Rear Panel Ass'y (U.S.A. & Canada)	1	L03	OE00953A	M4x10 ⊕ Binding (Black Chromate)	4
	HA04404A	Rear Panel Ass'y (Japan)	1	L04	OB08583A	Plastic Rivet (U.S.A., Canada, Japan, 220V Class 2, UK & Australia)	2
	HA04405A	Rear Panel Ass'y (Others)	1				
	HA04403A	Rear Panel Ass'y (UK)	1	L05	OE00594A	M3x8 ⊕ Binding (Bronze) (Others)	2
	HA04407A	Rear Panel Ass'y (220V Class 2)	1				
	HA04406A	Rear Panel Ass'y (Australia) Serial No.: A80101001 -	1				
01	OH04205A	Rear Panel	1				
02	BA04945A	Pin Jack P.C.B. Ass'y	1				
03	BA04944A	4P DIN Socket Ass'y	1				
04	BA04949A	8P DIN Socket Ass'y	1				
05	OB06639B	Power Transformer (U.S.A. & Canada)	1				
	OB06640B	Power Transformer (Japan)	1				
	OB06637B	Power Transformer (Others)	1				
	OB06638B	Power Transformer (UK, Australia & 220V Class 2)	1				
06	OB08037U	Cord Bushing C (U.S.A., Canada, Japan, 220V Class 2, Australia & Others)	1				
	OB08351A	Cord Bushing 4K-4 (UK)	1				
07	OB08533A	Power Cord (U.S.A. & Canada)	1				
	OB08219B	Power Cord (Japan)	1				
	OB08348A	Power Cord (UK)	1				
	OB08093U	Power Cord (220V Class 2)	1				
	OB05241A	Power Cord (Australia)	1				
08	OJ04601B	Switch Cover (U.S.A., Canada, Japan, 220V Class 2, UK & Australia)	1				
09	OM03946A	Voltage Selector Lock Plate C (Others)	1				
10	OB07092U	Voltage Selector (Others)	1				
L01	OE00921A	BT 3x8 ⊕ Binding (Black Chromate)	2				
L02	OE00714A	M2.6x6 ⊕ Binding (Bronze)	4				

5.5. Mechanism Ass'y (B02)

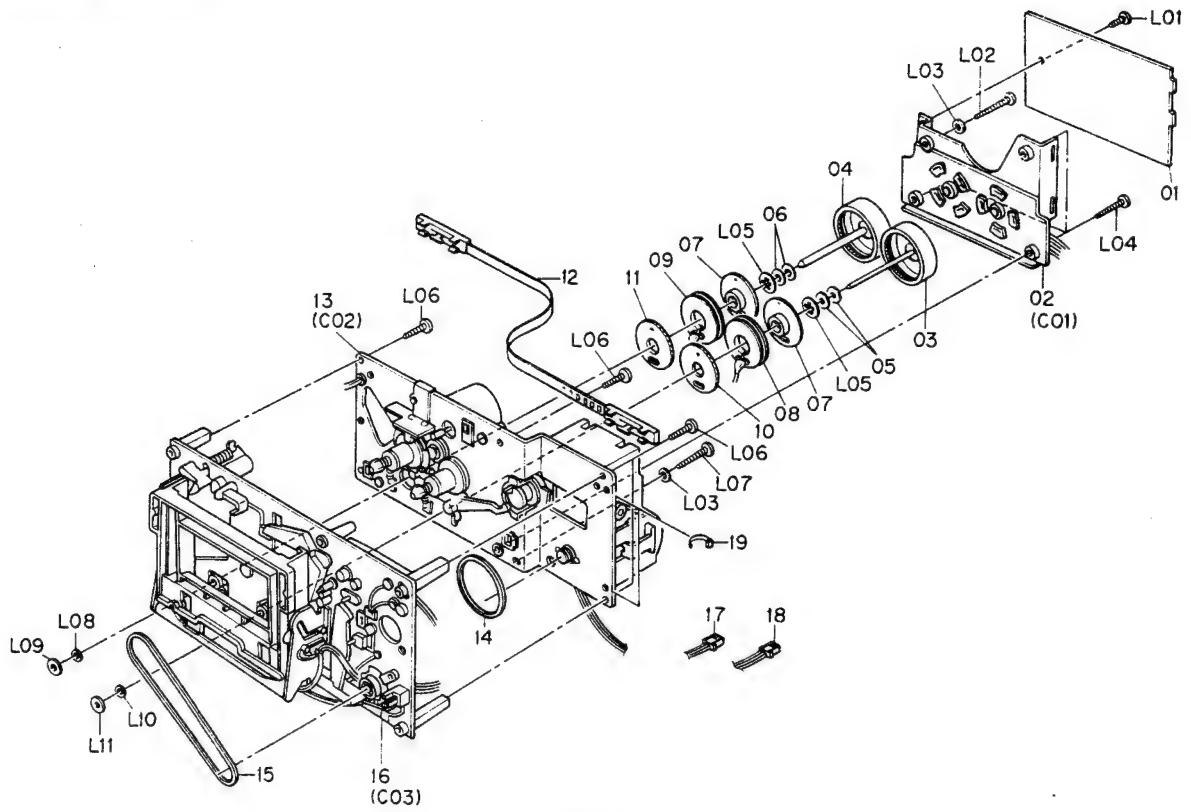


Fig. 5.5

5.6. Flywheel Holder Ass'y (C01)

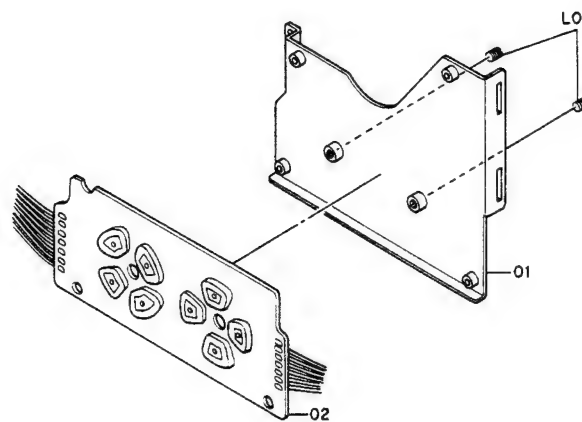


Fig. 5.6

5.7. Sub Mechanism Chassis Ass'y (C02)

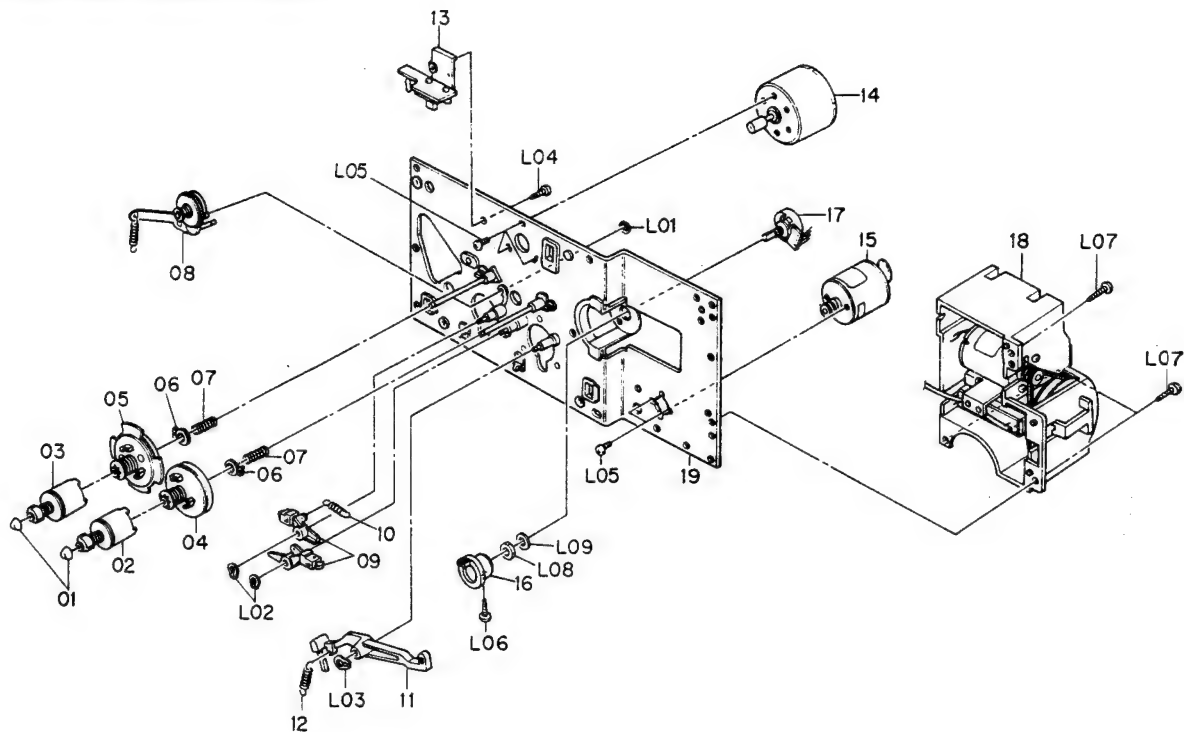


Fig. 5.7

Schematic Ref. No.	Part No.	Description	Q'ty	Schematic Ref. No.	Part No.	Description	Q'ty
B02	CA08445A	Mechanism Ass'y Serial No.: A80101001 -	1	C02	CA08444A	Sub Mechanism Chassis Ass'y Serial No.: A80101001 -	1
01	BA04941A	Motor Control P.C.B. Ass'y	1	01	0C08039B	Reel Hub Head	2
02	CA08422A	Flywheel Holder Ass'y	1	02	CA08038B	Reel Hub B Pulley Ass'y	1
03	CA08433A	Take-up Flywheel Sub Ass'y	1	03	CA08397A	Reel Hub S Pulley Ass'y	1
04	CA08434A	Supply Flywheel Sub Ass'y	1	04	CA08037A	Reel Hub Take-up Ass'y	1
05	0C08020B	Thrust Washer 2.6mm	2	05	CA08452A	Reel Hub Supply Ass'y	1
06	0C08021B	Thrust Washer 3.1mm	2	06	CA08039A	Back Tension Ass'y	2
07	0C08333A	Sensor Plate	2	07	0C08269A	Back Tension Spring C	2
08	CA08391A	Sensor Coil Take-up Sub Ass'y	1	08	CA08193A	Idler Ass'y	1
09	CA08454A	Sensor Coil Supply Sub Ass'y	1	09	CA08042A	Brake Ass'y	2
10	CA08483A	Sensor Gear Take-up Ass'y	1	10	0C08129B	Brake Arm Spring	1
11	CA08485A	Sensor Gear Supply Ass'y	1	11	0C08030C	Brake Drive Arm	1
12	0C08237A	Azimuth Wire	1	12	0C08128A	Brake Drive Arm Spring	1
13	CA08444A	Sub Mechanism Chassis Ass'y	1	13	BA04943A	Counter Pulse Generator P.C.B. Ass'y	1
14	0C08099B	Cam Motor Belt	1	14	CA08242A	Reel Motor Ass'y	1
15	0C08098B	Counter Belt B	1	15	CA08034A	Control Motor Ass'y	1
16	CA08443A	Main Mechanism Chassis Ass'y	1	16	0C08053B	Volume Coupler	1
17	0B02333B	3P-H Connector (Blue with Shield)	1	17	0B07240A	Volume Control 10K (B)	1
18	0B08672A	3P-H Connector	1	18	CA08453A	Playback Head Azimuth Alignment Motor Ass'y	1
19	0B08515A	Insu-Lock	1	19	CA08194A	Sub Chassis Ass'y B	1
L01	0E00857A	BT 3x6 @ Pan	1	L01	0E00698A	E-Ring 2.5mm	1
L02	0E00834A	BT 3x30 @ Pan	1	L02	0E00837A	Stopper Ring 3mm	2
L03	0E00178A	Washer 3.3x8x0.5	2	L03	0E00838A	Stopper Ring 4mm	1
L04	0E00833A	BT 3x20 @ Pan	3	L04	0E00859A	BT 2.6x6 @ Binding	1
L05	0E03023A	Stopper Ring 8mm	2	L05	0E00226A	M2.6x4 @ Pan	5
L06	0E00883A	BT 3x18 @ Pan	5	L06	0E00792A	BT2.6x6 @ Pan	1
L07	0E00835A	BT 3x25 @ Pan	1	L07	0E00846A	BT 3x8 @ Pan	3
L08	0C08347A	Washer 3.1mm FT	1	L08	—	Volume Nut	(1)
L09	0C08345A	Capstan Washer 3mm	1	L09	—	Volume Washer	(1)
L10	0C08348A	Washer 2.6mm FT	1				
L11	0C08346A	Capstan Washer 2.5mm	1				
C01	CA08422A	Flywheel Holder Ass'y Serial No.: A80101001 -	1				
01	CA08382B	Flywheel Holder Sub Ass'y	1				
02	BA04942A	Motor P.C.B. Ass'y	1				
L01	0C08068C	Thrust Screw	2				

5.8. Main Mechanism Chassis Ass'y (C03)

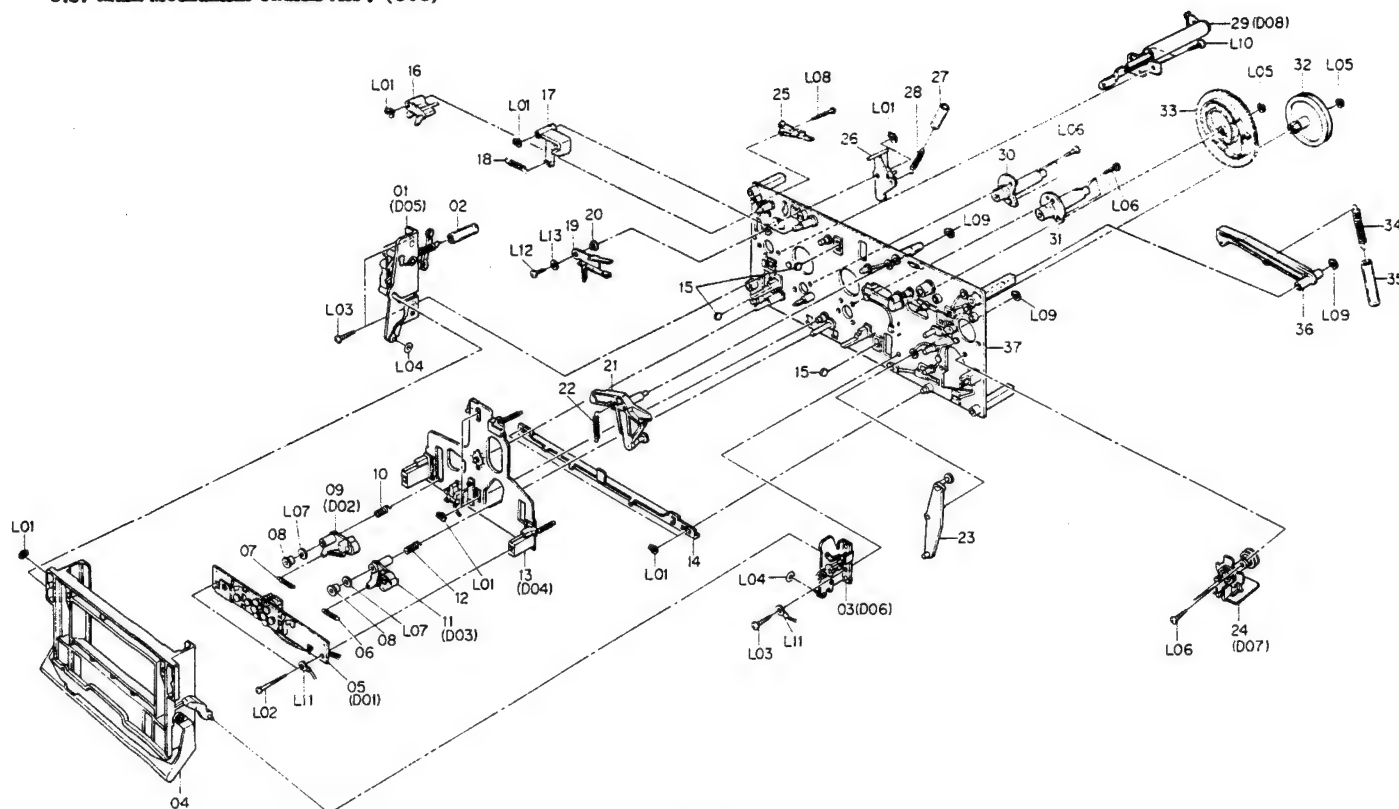


Fig. 5.8

Schematic Ref. No.	Part No.	Description	Q'ty	Schematic Ref. No.	Part No.	Description	Q'ty
C03	CA08443A	Main Mechanism Chassis Ass'y Serial No.: A80101001 -	1	36	CA08028A	Counter-Load Arm	1
01	CA08350A	Cassette Case Holder L Ass'y	1	37	CA08347A	Main Chassis Ass'y	1
02	OC08152A	Lid Arm Spring Tube	1	L01	OE00837A	Stopper Ring 3mm	9
03	CA08455A	Cassette Case Holder R Ass'y	1	L02	OE00834A	BT 3x30 @ Pan	2
04	CA08451A	Cassette Case Ass'y	1	L03	OE00831A	BT 3x10 @ Pan	3
05	CA08438A	Head Mount Base Ass'y	1	L04	OE00254A	Washer 3.1mm	2
06	OC08250A	Take-up Roller Arm Spring	1	L05	OE00222A	E-Ring 2mm	2
07	OC08121A	Supply Roller Arm Spring	1	L06	OE00876A	BT 2.6x8 @ Pan	8
08	OC08313A	Pressure Roller Arm Bushing	2	L07	OE00178A	Washer 3mm	2
09	CA08437A	Supply Pressure Roller Arm Ass'y	1	L08	OE00879A	BT 2x15 @ Pan	1
10	OC08122C	Supply Pressure Roller Thrust Spring	1	L09	OE00838A	Stopper Ring 4mm	3
11	CA08436A	Take-up Pressure Roller Arm Ass'y	1	L10	OE00846A	BT 3x8 @ Pan	3
12	OC08183B	Take-up Pressure Roller Thrust Spring	1	L11	OE00895A	Earth Lug 3mm	2
13	CA08339A	Head Base Ass'y	1	L12	OE00859A	BT 2.6x6 @ Binding	1
14	OC08368A	Pressure Roller Drive Bar D	1	L13	OC08255A	Washer 2.6mm	1
15	OC08086B	Head Base Roller	3				
16	OC08050B	Record Sensor Arm	1				
17	OC08051E	Cassette Hold Arm	1				
18	OC08120A	Cassette Hold Arm Spring	1				
19	OC08371A	Back Tension Arm Ass'y	1				
20	OC08254A	Back Tension Arm Collar	1				
21	OC08027A	Head Base Drive Arm Ass'y	1				
22	OC08143C	Head Base Drive Arm Spring	1				
23	CA08026A	Pressure Roller Drive Arm Ass'y	1				
24	CA08441A	Auto Shut-off Ass'y	1				
25	OC08119A	Record Protector	1				
26	OC08194C	Damper Lock Arm	1				
27	OC08153A	Damper Lock Arm Spring Tube	1				
28	OC08116A	Record Arm Spring	1				
29	CA08030A	Pneumatic Damper Ass'y	1				
30	CA08404B	Supply DD Flange Ass'y	1				
31	CA08457A	Take-up DD Flange Ass'y	1				
32	CA08186A	Cam Drive Gear	1				
33	OC08029H	Control Cam	1				
34	OC08117A	Counter-Load Arm Spring	1				
35	OC08152A	Counter-Load Arm Spring Tube	1				

5.9. Head Mount Base Ass'y (D01)

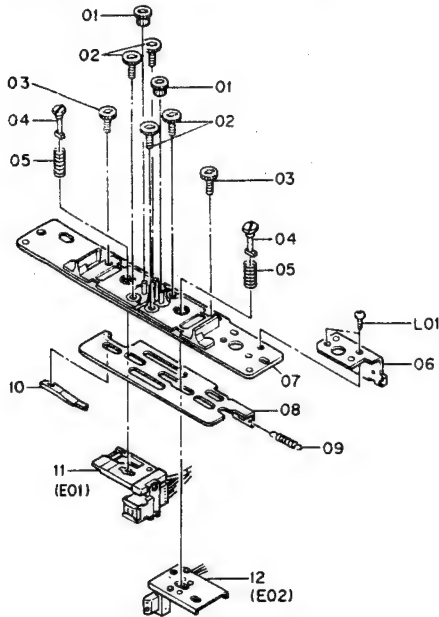


Fig. 5.9

5.10. Supply Pressure Roller Ass'y (D02)

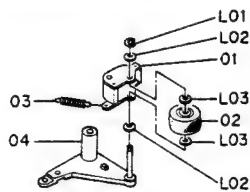


Fig. 5.10

5.11. Take-up Pressure Roller Ass'y (D03)

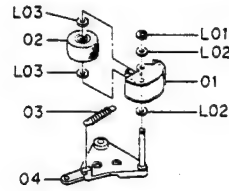


Fig. 5.11

5.12. Head Base Ass'y (D04)

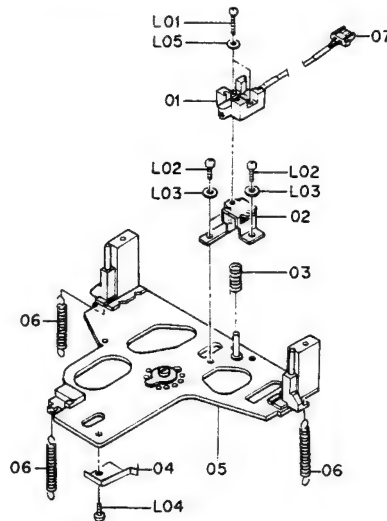


Fig. 5.12

5.13. Cassette Case Holder L Ass'y (D05)

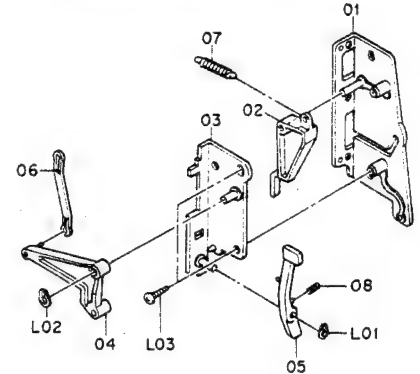


Fig. 5.13

Schematic Ref. No.	Part No.	Description	Q'ty	Schematic Ref. No.	Part No.	Description	Q'ty
D01	CA08438A	Head Mount Base Ass'y Serial No.: A80101001 -	1	L01	0E00042A	E-Ring 1.5mm	1
01	OC08028C	Head Height Adjustment Screw	2	L02	OC08024A	Washer 2mm 0.25T	2
02	OC08027F	Head Height Adjustment Gear	4	L03	OC08365A	Washer 2mm 0.13T	2
03	OC08026D	Azimuth Alignment Screw	2	D04	CA08339A	Head Base Ass'y Serial No.: A80101001 -	1
04	OC08161B	Spring Stopper	2	01	GA02103A	EOK Erase Head	1
05	OC08187B	Head Plate Spring	2	02	OC08158D	Erase Head Hold Plate	1
06	OC08315A	Azimuth Alignment Wire Hold Plate	1	03	OC08166A	Erase Head Hold Plate Spring	1
07	CA08083D	Head Mount Base Sub Ass'y	1	04	OC08174D	Cassette Hold Spring	1
08	OC08352A	AP Drive Plate	1	05	CA08003R	Head Base Ass'y	1
09	OC08362A	TG Spring	1	06	OC08175A	Head Base L Spring	3
10	OC08351A	PH Azimuth Plate	1	07	0B08944A	2P-H Connector	1
11	CA08439A	PA-1L Playback Head Ass'y	1	L01	0E00951A	M1.7x7 @ Pan (Black Chromate)	2
12	CA08440A	R-8L Record Head Ass'y	1	L02	0E00909A	M2x6 @ Pan	3
L01	0E00917A	BT 2.6x5 @ Pan	2	L03	0E00117A	Washer 2mm	3
D02	CA08437A	Supply Pressure Roller Arm Ass'y Serial No.: A80101001 -	1	L04	0E00853A	BT 2x3 @ Pan	1
01	CA08403A	Supply Tape Guide	1	L05	0E00952A	Washer 1.7mm	2
02	OC08357A	Pressure Roller	1	D05	CA08350A	Cassette Case Holder L Ass'y Serial No.: A80101001 -	1
03	OC08495A	Supply Guide Spring	1	01	CA08326B	Cassette Case Holder L Sub Ass'y	1
04	CA08401A	Supply Roller Arm Ass'y	1	02	OC08073C	Lid Arm A	1
L01	0E00042A	E-Ring 1.5mm	1	03	OC08306A	Eject Arm Holder	1
L02	OC08024A	Washer 2mm 0.25T	2	04	OC08307A	Eject Arm A	1
L03	OC08365A	Washer 2mm 0.13T	2	05	OC08197C	Eject Arm B	1
D03	CA08436A	Take-up Pressure Roller Arm Ass'y Serial No.: A80101001 -	1	06	OC08199B	Eject Arm Joint	1
01	CA08402A	Take-up Tape Guide	1	07	OC08114A	Lid Arm Spring	1
02	OC08357A	Pressure Roller	1	08	OC08211C	Eject Arm Spring	1
03	OC08362A	Take-up Guide Spring	1	L01	0E00837A	Stopper Ring 3mm	1
04	CA08400A	Take-up Roller Arm Sub Ass'y	1	L02	0E00838A	Stopper Ring 4mm	1
				L03	0E00865A	BT 3x10 @ Binding	2

5.14. Cassette Case Holder R Ass'y (D06)

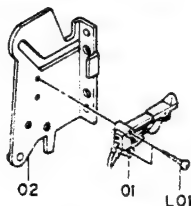


Fig. 5.14

5.15. Auto Shut-off Ass'y (D07)

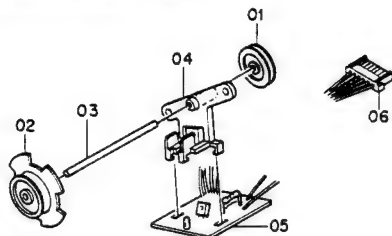


Fig. 5.15

5.16. Pneumatic Damper Ass'y (D08)

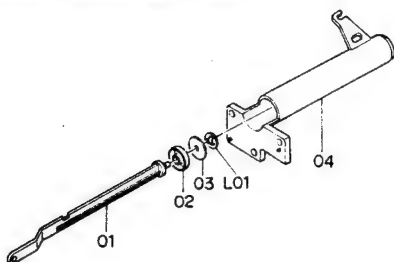


Fig. 5.16

5.17. PA-1L Playback Head Ass'y (E01)

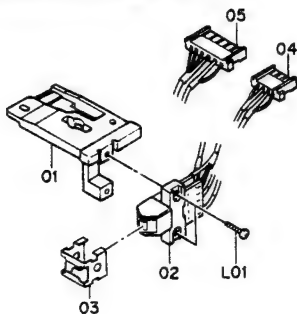


Fig. 5.17

5.18. R-8L Record Head Ass'y (E02)

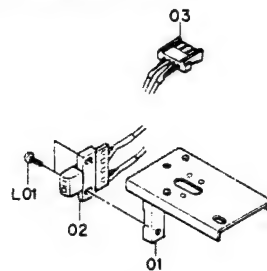


Fig. 5.18

Schematic Ref. No.	Part No.	Description	Q'ty
D06	CA08455A	Cassette Case Holder R Ass'y Serial No.: A80101001 -	1
01	0C08133A	Eject Sensor	1
02	CA08427A	Cassette Case Holder R Sub Ass'y	1
L01	0E00840A	BT 2x8 @ Pan	1
D07	CA08441A	Auto Shut-off Ass'y Serial No.: A80101001 -	1
01	0C08047A	Shut-off Pulley A	1
02	0C08309B	Shut-off Pulley B	1
03	0C08088B	Shut-off Pulley Shaft	1
04	0C08207B	Shut-off Pulley Holder	1
05	BA04852A	Shut-off P.C.B. Ass'y	1
06	0B02339B	6P-H Connector	1
D08	CA08030A	Pneumatic Damper Ass'y Serial No.: A80101001 -	1
01	0C08058C	Damper Piston	1
02	0C08102C	Damper Ring	1
03	0C08010C	Damper Plate	1
04	0C08059D	Sylinder	1
L01	0E00874A	Stopper Ring CS 2mm	1
E01	CA08439A	PA-1L Playback Head Ass'y Serial No.: A80101001 -	1
01	0C08350B	Playback Head Plate	1
02	GA02162A	PA-1L Playback Head	1
03	0C08349C	Tape Protector	1
04	0B02341B	4P-H Connector	1
05	0B02342B	6P-H Connector	1
L01	0E00886A	M1.7x6.5 @ Pan	1
E02	CA08440A	R-8L Record Head Ass'y Serial No.: A80101001 -	1
01	CA08308A	Record Head	1
02	GA01050A	R-8L Record Head	1
03	0B02340B	4P-H Connector	1
L01	0E00887A	M1.7x4 @ Pan	2

- Notes: 1. Mounting diagram shows a dip side view of the printed circuit board.
 2. Diode is 1SS53, 1S1555, or 1SS176 unless otherwise specified.
 3. Following transistors are interchangeable with each other.
 a. 2SA733, 2SA608SP, 2SA1048, 2SA1175
 b. 2SC945, 2SC536SP, 2SC2458, 2SC2785
 4. Abbreviation for part name:
 TR — Transistor, SiD — Silicon Diode, GD — Germanium Diode, ZD — Zener Diode
 RK — Carbon Resistor, RM — Metal Film Resistor, RF — Fail Safe Type Resistor, RC — Cement Resistor,
 RW — Wire Wound Resistor
 CE — Electrolytic Capacitor, CM — Mylar Capacitor, CC — Ceramic Capacitor, CP — PP Capacitor,
 CT — Tantalum Capacitor, CF — Film Capacitor, C — Mica Capacitor

6.1. Power Switch P.C.B. Ass'y

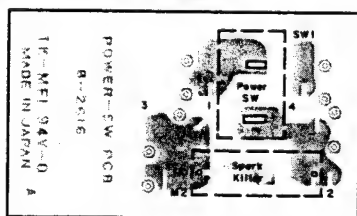


Fig. 6.1

6.2. Fuse P.C.B. Ass'y

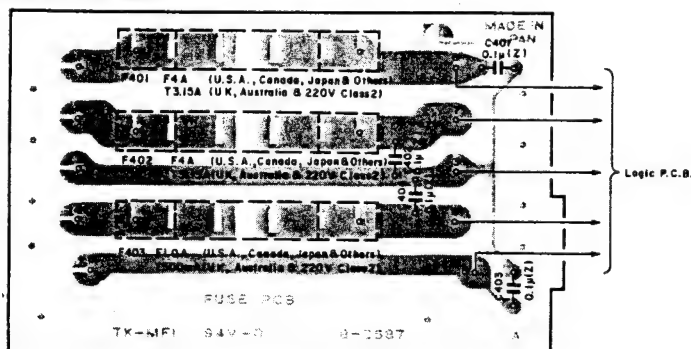


Fig. 6.2

6.3. Shut-off P.C.B. Ass'y

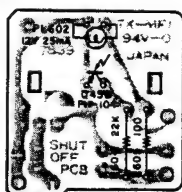


Fig. 6.3

6.4. Counter Pulse Generator P.C.B. Ass'y

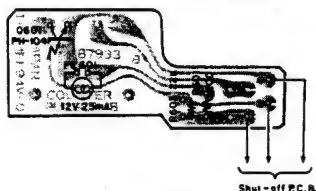


Fig. 6.4

Schematic Ref. No.	Part No.	Description	Schematic Ref. No.	Part No.	Description	Schematic Ref. No.	Part No.	Description
	BA04947A	Power Switch P.C.B. Ass'y (U.S.A. & Canada)		BA04899A	Fuse P.C.B. Ass'y (U.S.A., Canada & Others)		OM04432A	Fuse Label 4A 125V x 2 (U.S.A., Canada & Others) (1)
	BA04946A	Power Switch P.C.B. Ass'y (Japan)		BA04898A	Fuse P.C.B. Ass'y (Japan)		OM04441A	Fuse Label 4A 250V x 2 (Japan) (1)
	BA04948A	Power Switch P.C.B. Ass'y (UK, Australia, 220V Class 2 & Others)		BA04900A	Fuse P.C.B. Ass'y (UK, Australia & 220V Class 2)		OM03936B	Fuse Label T3.15A 250V (UK, Australia & 220V Class 2) (1)
SW1	OB02616A	Power Switch P.C.B.	C401,402	OB02587A	Fuse P.C.B.		OB08349A	Fuse Clip (UK, Australia & 220V Class 2) (6)
	OB07407A	Power Switch (U.S.A. & Canada)	403,404	OBT9292A	CC 0.1μ 50V Z			
SW1	OB07406A	Power Switch (Japan)	F401,402	OB90002A	Fuse F4A 125V (U.S.A., Canada & Others)		BA04852A	Shut-off P.C.B. Ass'y
SW1	OB07408A	Power Switch (UK, Australia, 220V Class 2 & Others)	F401,402	OB90001A	Fuse F4A 250V (Japan)		OB07839B	Shut-off P.C.B.
M2	OB08342A	Spark Killer (U.S.A. & Canada)	F401,402	OB08281A	Fuse T3.15A 250V (UK, Australia & 220V Class 2)	Q450	OB06228A	Photo TR PH104
M2	OB08363A	Spark Killer (Japan)	F403	OB08374A	Fuse F1A 250V (U.S.A., Canada & Others)	R604	OB05615A	RK 22K 1/4W J
M2	OB08955A	Spark Killer (UK, Australia, 220V Class 2 & Others)	F403	OB08686A	Fuse F1A 250V (Japan)	R605	OB09215A	RF 100 1/4W J
	OE00622A	M3x5 ♂ Pan (2A) (2)	F403	OB08457A	Fuse T500mA 250V (UK, Australia & 220V Class 2)	PL602	OB08552A	Lamp 12V 25mA
	OE00752A	Eyelet 2x3 (2)		OM04190A	Fuse Label 1A 250V (U.S.A., Canada & Japan) (1)		BA04943A	Counter Pulse Generator P.C.B. Ass'y
	OJ04646A	Power Switch Holder (1)		OM04096C	Fuse Label T500mA (UK, Australia & 220V Class 2) (1)	Q601	OB07933B	Counter Pulse Generator P.C.B.
						R601	OB06228A	Photo TR PH104
						R603	OB09215A	RF 100 1/4W J
						PL601	OB05661A	RK 22K 1/4W JV
							OB08552A	Lamp 12V 25mA
							OC08281B	P.C.B. Holder (1)
							OE00792A	BT 2.6x6 ♂ Pan (Chromate) (2)

[illegible]

SW620 PlayRec. SW619 Timer

Diagram showing the internal structure of the SW620 PlayRec and SW619 Timer components, which are connected to the FC-43 connector.

Schematic Ref. No.	Part No.	Description
LED621 622 R601,602 R603	BA04895A	Direction P.C.B. Ass'y
	OB02584A OB06448A	Direction P.C.B. LED (RED + GRN)
	OB05575A OB01857A	RK 560 1/4W J RK 1K 1/4W J
SW619,620	BA04897A	Timer Switch P.C.B. Ass'y
	OB02586B OB07464A	Timer Switch P.C.B. Push Switch
SW618	BA04891A	Tape Select P.C.B. Ass'y
	OB02580B OB07461A	Tape Select P.C.B. Push Switch
Q101,102 201,202 VR107,207 VR301 VR302 R101,201 R102,202 R103,203 R104,204 C101,201 FC37	BA04890A	Volume P.C.B. Ass'y
	OB02579B OBT6299A	Volume P.C.B. TR 2SC2878
	OB07202A	VR 100K (A)
	OB07203A	VR 100K (A)x2
	OB07204A	VR 10K (A)x2
	OBT1846A	RK 4.7K 1/4W J
	OBT1887A	RK 5.6K 1/4W J
	OBT5691A	RK 390 1/4W J
	OBT5622A	RK 2.2K 1/4W J
	OBT9187A	CE 1μ 50V (BP)
	OB82037A	3P Flat Cable
	OM04252A	Label CN-37 (1)
IC601 Q601,602 603,604 LED601 R601,602 603,604 R605,606 607,609 610 R608,611 R612 C601 CN11 CN12 CN13	BA04894A	Counter P.C.B. Ass'y
	OB02583A OB06368A OB06319A	Counter P.C.B. IC LM6416E-106 TR 2SA608SP
	OB06442A OBT9671A	Counter LED RK 560 1/6W J
	OBT9661A	RK 220 1/6W J
	OBT1933A OBT9701A OBT9393A	RK 220 1/4W J RK 10K 1/6W J CC 68P 50V J
	OB02344A OB02345B OB02346A	2P-H Connector 4P-H Connector 8P-H Connector
IC301,302 Q101,201 LED303 D101,201 D102,202 R101,201 R102,202 R103,104 203,204 R301-320 R321,326 R322 R323 R324 R325 C301 FC34 FC35 FC44,45	BA04893A	Indicator P.C.B. Ass'y
	OB02582B OB06369A OB06401A OB06441A OBT6398A OB06109A OBT9725A OBT9709A OBT9719A	Indicator P.C.B. IC TA7612AP TR 2SC536SP Indicator LED SID 1S176 SID GP08B RK 100K 1/6W J RK 22K 1/6W J RK 56K 1/6W J
	OBT9681A OBT9701A OBT9695A OBT1857A OBT9655A OBT9677A OBT9282A OB05360B OB05352B OB05374C	RK 1.5K 1/6W J RK 10K 1/6W J RK 5.6K 1/6W J RK 1K 1/4W J RK 120 1/6W J RK 1K 1/6W J CC 100P 50V K 4P Flat Cable 3P Flat Cable 11P Flat Cable
	OM04250A OM04251A OE00130A	Label CN-34 (1) Label CN-35 (1) Earth Lug 2.6mm (1)

6.10. Indicator P.C.B. Ass'y

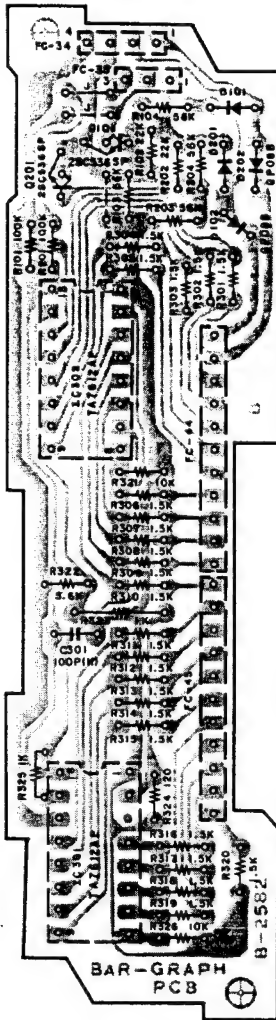


Fig. 6.10

6.11. Switch P.C.B. Ass'y

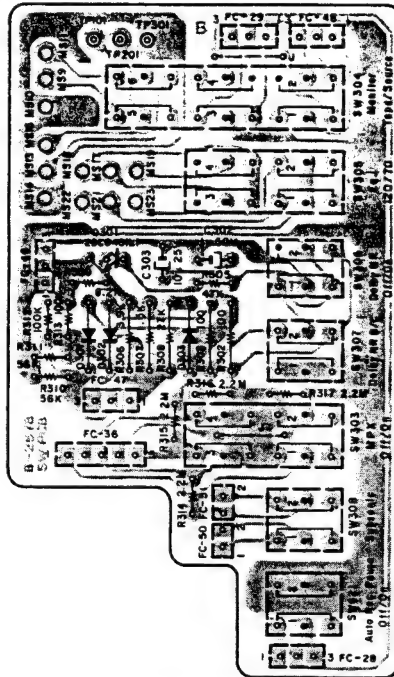


Fig. 6.11

Schematic Ref. No.	Part No.	Description
	BA04889A	Switch P.C.B. Ass'y
Q301	OB02578B	Switch P.C.B.
D301,302	OBT1872A	TR 2SC945L (P,Q)
303	OBT6181A	SID 1SS53
R302,303	OBT9653A	RK 100 1/6W J
R305	OBT9717A	RK 47K 1/6W J
R306	OBT5675A	RK 3.9K 1/4W J
R307	OBT5506A	RK 1.5K 1/4W J
R308	OBT5743A	RK 27K 1/4W J
R309	OBT9699A	RK 8.2K 1/6W J
R310,311	OBT9719A	RK 56K 1/6W J
R312,313	OBT9725A	RK 100K 1/6W J
R314,315	OBT5671A	RK 2.2M 1/4W J
316,317		
C302	OBT1405A	CE 1u 50V
C303	OBT1674A	CE 10u 25V
FC28	OB82035A	3P Flat Cable
FC29	OB82034A	3P Flat Cable
FC36	OB82036A	5P Flat Cable
FC50	OB05331B	2P Flat Cable
FC51	OB82001B	2P Flat Cable
	OB07460A	Push Switch (1)
	OM04240A	Label CN-28 (1)
	OM04438A	Label CN-29 (1)
	OM04440A	Label CN-36 (1)

6.12. Control P.C.B. Ass'y

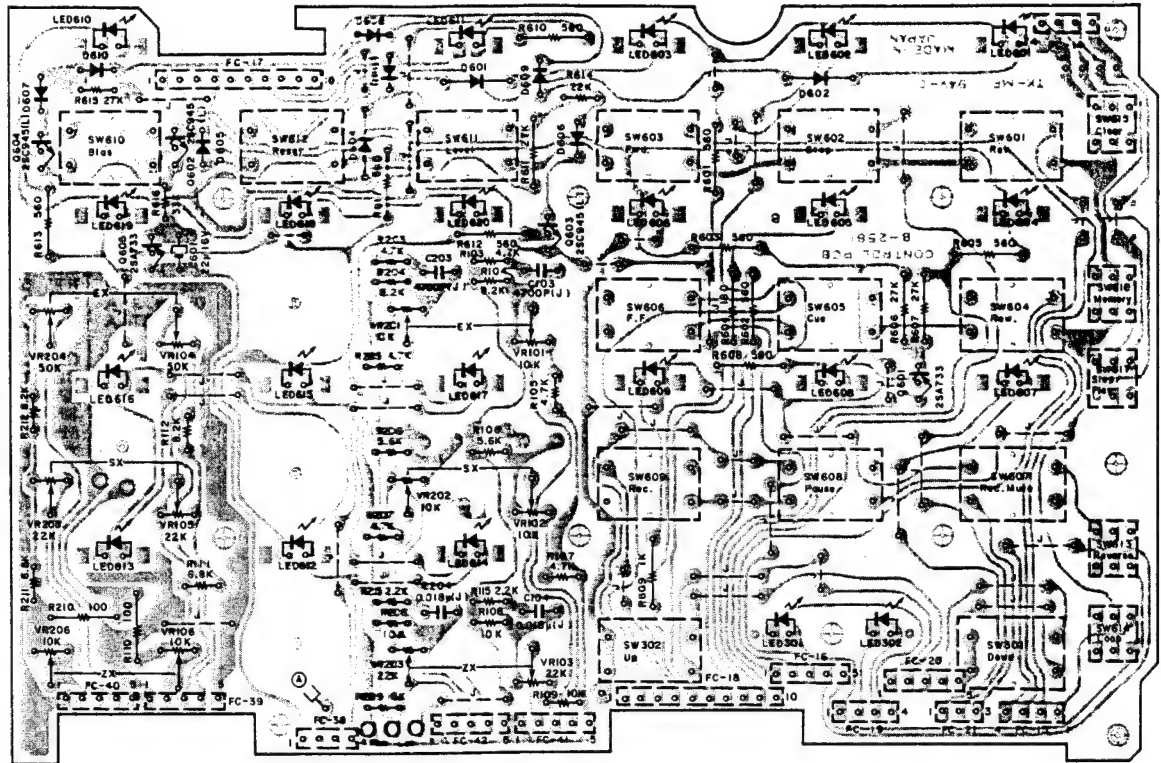


Fig. 6.12

6.13. Motor Control P.C.B. Ass'y

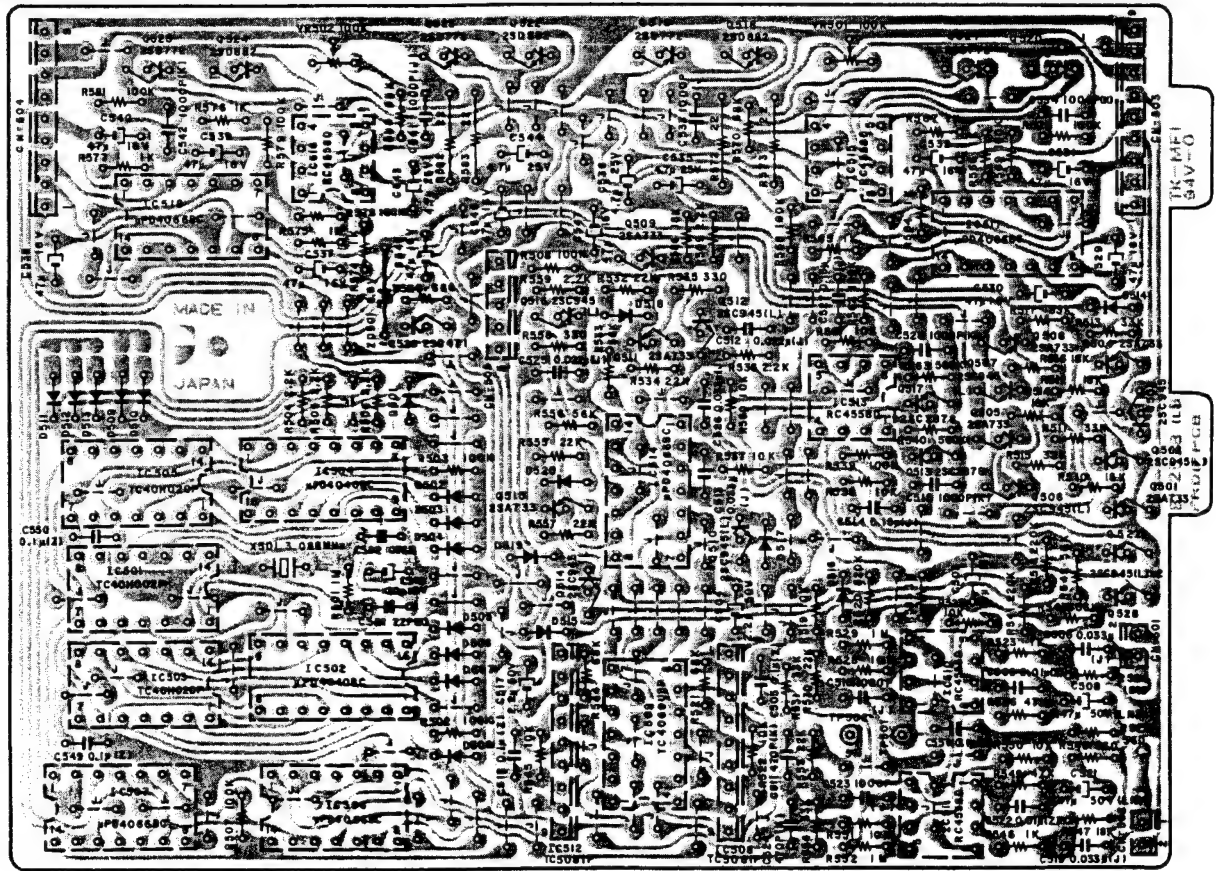


Fig. 6.13

Schematic Ref. No.	Part No.	Description	Schematic Ref. No.	Part No.	Description	Schematic Ref. No.	Part No.	Description
	BA04892A	Control P.C.B. Ass'y		BA04941A	Motor Control P.C.B. Ass'y	C508,521	OBT9222A	CE 0.47μ 50V (LN)
Q601,605	OB02581B	Control P.C.B.				C509,522	OBT9290A	CC 0.01μ 50V Z
Q602,603	OBT6013A	TR 2SA733 (P,Q)		OB02588B	Motor Control P.C.B.	C510,523	OBT9844A	CF 1000P 50V J
604	OBT1872A	TR 2SC945L (P,Q)	IC501			533,541		
D601,602	OBT6181A	SiD 1SS53	IC502,504	OB06423A	IC TC40H002P	C511,524	OBT9286A	CC 470P 50V K
604			IC503,505	OB06223A	IC μPD4040BC	C512,525	OBT9848A	CF 0.022μ 50V J
D603,605	OBT6398A	SiD 1SS176	IC506,507	OB06424A	IC TC40H020P	C514,527	OBT5914A	CM 0.15μ 50V J
606,607			514,517	OB06144A	IC μPD4066BC	C515,528	OBT9288A	CC 1000P 50V K
608,609			518			534,542		
610			IC508,512	OB06297A	IC TC5081P	C529,530	OBT1403A	CE 47μ 16V
LED301	OB06445A	LED ORN TLO-123 (15)	IC509	OB06270A	IC TC4069UBP	531,532		
302,607			IC510,511	OB06124B	IC RC4558D	537,538		
609-620			513,515			539,540		
LED601	OB06446A	LED GRN TLPG-163	516			545,546		
602,603			Q501,504	OBT6013A	TR 2SA733 (P,Q)	547	OBT1402A	CE 4.7μ 25V
604,605			505,508			C535,536		
606,608			509,511			543,544	OBT5885A	CE 100μ 10V
VR101,102	OB07404A	Semi-fixed VR 10K	515	OBT1872A	TR 2SC945L (P,Q)	C548	OB02280A	2P-T Post
106,201			Q502,503			CN501	OB08656A	2P-T Post
202,206			506,507			CN502	OB08645A	9P-T Post
VR103,105	OB07277A	Semi-fixed VR 22K	510,512			CN503,504	OB08724A	5P-T Post
203,206			514,516			CN505	OE00507A	Nut Hex. M3 (8)
VR104,204	OB07260A	Semi-fixed VR 50K	527,528				OE00521A	(Chromate) M3x8 @ Fan (8)
R103,105	OBT9693A	RK 4.7K 1/6W J	Q513,517	OBT6299A	TR 2SC2878			
107,203			Q518,520	OB06316A	TR 2SD882 (P,Q)		OJ04485A	(Chromate) Heat Sink B (4)
205,207			522,524					
R104,112	OBT9699A	RK 8.2K 1/6W J	Q519,521	OB06303A	TR 2SB772 (P,Q)			
204,212			523,525					
R106,206	OBT9695A	RK 5.6K 1/6W J	Q526	OB06066A	TR 2SD471 (L,M)			
R108,109	OBT9701A	RK 10K 1/6W J	ZD501	OBT6426A	ZD 8.6V XZ086			
208,209			D501-520	OBT6398A	SiD 1SS176			
R110,210	OBT1679A	RK 100 1/4W J	X501	OB02324A	Xtal 3.088MHz			
R111,211	OBT9697A	RK 6.8K 1/6W J	VR501,502	OB09060A	Semi-fixed VR 100K			
R115,215	OBT9685A	RK 2.2K 1/6W J	R501,529	OBT9749A	RK 1M 1/6W J			
R601,602	OBT5575A	RK 560 1/4W J	552,585	OBT9725A	RK 100K 1/6W J			
603,605			R502,503					
608,610			507,508					
612,613			539,562					
617			568,569					
R604	OBT5578A	RK 180 1/4W J	571,578					
R606,607	OBT5743A	RK 27K 1/4W J	579,581					
611			R504,505	OBT9685A	RK 2.2K 1/6W J			
R609	OBT1857A	RK 1K 1/4W J	506,509					
R614	OBT9709A	RK 22K 1/6W J	536,559	OBT9707A	RK 18K 1/6W J			
R615	OBT9711A	RK 27K 1/6W J	R510,512					
R616	OBT9713A	RK 33K 1/6W J	514,516					
C103,203	OBT9852A	CF 4700P 50V J	524,547					
C104,204	OBT9854A	CF 6800P 50V J	586					
C601	OBT1862A	CE 22μ 16V	R511,513	OBT9713A	RK 33K 1/6W J			
SW301,302	OB07396A	Double Action Switch	515,517					
			531,554	OBT9733A	RK 220K 1/6W J			
SW601-612	OB07459A	Switch	R518,541	OBT9701A	RK 10K 1/6W J			
SW613,614	OB07462A	Push Switch	R519,522					
616,617			527,528					
SW615	OB07463A	Push Switch	537,538					
FC14,15	OB05361B	4P Flat Cable	545,550					
FC16	OB05371B	5P Flat Cable	551,560					
FC17	OB05372B	10P Flat Cable	561					
FC18	OB82038A	10P Flat Cable	R520	OBT9747A	RK 820K 1/6W J			
FC19	OB05360B	4P Flat Cable	R521,544	OBT9721A	RK 68K 1/6W J			
FC20	OB05370B	5P Flat Cable	570,580	OBT9677A	RK 1K 1/6W J			
FC21	OB05346B	3P Flat Cable	R523,546					
FC38	OB05354B	4P Flat Cable	564,565					
FC39,40	OB05365B	5P Flat Cable	566,567					
FC41,42	OB05368B	5P Flat Cable	574,575					
	OE00857A	BT 3x6 @ Binding (Chromate) (1)	576,577					
	OJ04653A	Lens House (20)	R525,548	OBT9671A	RK 560 1/6W J			
	OJ04654A	Fader House (1)	R526,549	OBT9717A	RK 47K 1/6W J			
	OM04231A	Label CN-14 (1)	R530,532	OBT9709A	RK 22K 1/6W J			
	OM04222A	Label CN-15 (1)	534,553					
	OM04223A	Label CN-16 (1)	555,557					
	OM04224A	Label CN-17 (1)	R533,542	OBT9719A	RK 56K 1/6W J			
	OM04330A	Label CN-18 (1)	543,556					
	OM04225A	Label CN-19 (1)	R535,558	OBT9665A	RK 330 1/6W J			
	OM04226A	Label CN-20 (1)	R540,563	OBT9743A	RK 560K 1/6W J			
	OM04232A	Label CN-21 (1)	R572,573	OB09049A	RF 22 1/4W J			
			582,583					
			R584	OBT9673A	RK 680 1/6W J			
			C501	OBT9279A	CC 22P 50V K			
			C502	OBT9277A	CC 10P 50V J			
			C503	OBT1392A	CE 470μ 16V			
			C504,517	OBT9372A	CE 2.2μ 50V			
			C505,518	OBT9292A	CC 0.1μ 50V Z			
			549,550					
			551					
			C506,513	OBT5583A	CM 0.033μ 50V J			
			519,526					

Schematic Ref. No.	Part No.	Description	Schematic Ref. No.	Part No.	Description	Schematic Ref. No.	Part No.	Description
	BA04886A	Logic P.C.B. Ass'y	D602-611	OBT6398A	SiD 1SS176 (27)	R706	OBT9711A	RK 27K 1/6W J
	— DC Supply —		614-619			R712,713	OBT5509A	RK 33K 1/4W J
			623,624			R717	OBT1683A	RK 15K 1/4W J
			626-633			R731	OBT09217A	RF 5.6 1/4W J
IC401	OBT6124B	IC JRC4558D	640			C601,602	OBT9283A	CC 220P 50V K
Q403,404	OBT1872A	TR 2SC945L (P,Q)	X601	OBT08908A	Xtal KBR400BT	C603,604	OBT1405A	CE 1μ 50V
409,414			X602	OBT02307A	Xtal KBR800H	630		
415			VR601	OBT07258A	Semi-fixed VR 220K	C606,615	OBT1402A	CE 4.7μ 25V
Q407,408	OBT6013A	TR 2SA733 (P,Q)	VR602	OBT07257A	Semi-fixed VR 100K	618		
411			VR603	OBT07329A	Semi-fixed VR 2K	C607	OBT9852A	CF 4700P 50V J
Q410,412	OBT6322A	TR 2SC2002 (K,L)	VR604	OBT07256A	Semi-fixed VR 10K	C608,609	OBT9282A	CC 100P 50V K
Q416	OBT1426A	TR 2SA562 (O,Y)	R601,607	OBT9725A	RK 100K 1/6W J	C612,613	OBT1412A	CE 10μ 16V
ZD401	OBT6058A	ZD 5.1V YZ051	608,611			C614	OBT9276A	CC 5P 50V J
ZD402	OBT6384A	ZD 5.5V XZ055	612,613			C616	OBT1502A	CE 330μ 16V
D401	OBT6283A	Diode Bridge DBA30	614,615			C617	OBT9327A	CE 0.33μ 50V (LN)
D402,403	OBT6109A	SiD GP08B	627,632			C619	OBT9865A	CF 0.056μ 50V J
D404	OBT6282A	Diode Bridge DBA10	649,667			C620	OBT9370A	CC 33P 50V J
D405,406	OBT6398A	SiD 1SS176	672,693			CN7	OBT02347A	3P-T Post BLU
D407	OBT6181A	SiD 1SS53	694,696			CN8	OBT08653A	3P-T Post
R401,426	OBT1857A	RK 1K 1/4W J	703,704			CN9	OBT02286A	6P-T Post BLU
R402	OBT1679A	RK 100 1/4W J	709,710			CN10	OBT08642A	6P-T Post
R403	OBT1846A	RK 4.7K 1/4W J	720,721			CN11	OBT08656A	2P-T Post
R404	OBT1888A	RK 10K 1/4W J	722,726			CN12	OBT08654A	4P-T Post
R405,415	OBT5671A	RK 2.2M 1/4W J	727,734			CN13	OBT08644A	8P-T Post
R406	OBT9528A	RM 13.7K 1/4W F	R603,651	OBT5622A	RK 2.2K 1/4W J		OBT08964A	TR Mica TO-126(2)
R407	OBT9203A	RM 10K 1/4W F	R604,609	OBT9749A	RK 1M 1/6W J		OE00507A	Nut Hex. M3 (2)
R408	OBT1887A	RK 5.6K 1/4W J	610,708					(Chromate)
R409	OBT5794A	RK 680 1/4W J	736				OE00510A	M3x8 @Pan (2A)
R410,417	OBT9504A	RM 11K 1/4W F	R605,616	OBT9701A	RK 10K 1/6W J			(2)
R411	OBT9677A	RK 1K 1/6W J	617,629				QJ04485A	Heat Sink B (1)
R412	OBT9653A	RK 100 1/6W J	639,659					
R413,431	OBT9693A	RK 4.7K 1/6W J	661,662				— Miscellaneous —	
R414	OBT9701A	RK 10K 1/6W J	676,681				OBT02577B	Logic P.C.B.
R416,420	OBT9695A	RK 5.6K 1/6W J	682,683			Q401,402	OBT06255A	TR 2SD880 (Y)
421			689,695			413		
R418,425	OBT9725A	RK 100K 1/6W J	699,711			Q405,406	OBT06256A	TR 2SB834 (Y,GR)
427			729,730				OBT08601A	TR Mica TO-220(5)
R419	OBT9707A	RK 18K 1/6W J	733,735				OBT08602A	TR Bushing TO-220
R422	OBT9667A	RK 390 1/6W J	738					(5)
R423,434	OBT9737A	RK 330K 1/6W J	R606,634	OBT1888A	RK 10K 1/4W J		OE00507A	Nut Hex. M3 (5)
R424	OBT9729A	RK 150K 1/6W J	673,690					(Chromate)
R428	OBT9713A	RK 33K 1/6W J	724,728				OE00608A	M3x10 @Pan (3A)
R429	OBT9719A	RK 56K 1/6W J	R618,697	OBT9707A	RK 18K 1/6W J			(Chromate)
R430	OBT5622A	RK 2.2K 1/4W J	698				QJ04647B	Heat Sink (1)
R432,433	OBT0243A	RF 4.7 1/2W J	R619,637	OBT9713A	RK 33K 1/6W J		OBT02349A	4P-JP Connector
C401	OBT40037A	CE 10000μ 25V	638,642			CN14,15		
C402	OBT0937A	CE 6800μ 25V	666,671			34		
C403,407	OBT1272A	CE 100μ 25V	691			CN16	OBT02350A	5P-JP Connector
C404,408	OBT9276A	CC 5P 50V J	R620	OBT9717A	RK 47K 1/6W J	CN17,18	OBT02355A	10P-JP Connector
C405	OBT09798A	CE 6800μ 16V	R621	OBT9712A	RK 30K 1/6W J	CN26,27	OBT02348A	3P-JP Connector
C406	OBT09799A	CE 4700μ 25V	R622	OBT9716A	RK 43K 1/6W J	28,29		
C409,411	OBT01397A	CE 1000μ 16V	R623,644	OBT9703A	RK 12K 1/6W J	FC22	OBT82033A	2P Flat Cable
C410	OBT9218A	CE 47μ 16V (LN)	R624,645	OBT9723A	RK 82K 1/6W J	FC23	OBT05337B	2P Flat Cable
C412	OBT1406A	CE 2200μ 16V	R625,668	OBT9727A	RK 120K 1/6W J	FC24	OBT05351B	3P Flat Cable
C413	OBT1405A	CE 1μ 50V	R626,628	OBT9737A	RK 330K 1/6W J	FC25	OBT05345B	3P Flat Cable
C414	OBT9873A	CF 0.27μ 50V J	633,652			FC43	OBT05352B	3P Flat Cable
			665,670				OBT02343B	5P-H Connector (1)
	— Logic —		674,678				OBT08515A	Insu-Lock (8)
			679,680				OBT90005A	Insu-Lock (1)
IC601	OBT06324A	IC LM6402A-052	718,719				OE00037A	Earth Lug B-5 (1)
IC602	OBT06392A	IC LM6416E-149	725,732				OE00857A	BT 3x6 @Binding (3)
IC603	OBT06124B	IC JRC4558D	R630	OBT5620A	RK 270K 1/4W J		OM04331A	Label CN-22 (1)
IC604	OBT06317A	IC μPD4030BC	R631	OBT5627A	RK 330K 1/4W J		OM04332A	Label CN-23 (1)
IC605	OBT06214A	IC μPD4071BC	R635	OBT9699A	RK 8.2K 1/6W J		OM04236A	Label CN-24 (1)
Q601,606	OBT6013A	TR 2SA733 (P,Q)	R636,732	OBT9689A	RK 3.3K 1/6W J		OM04237A	Label CN-25 (1)
607,611			R640,653	OBT9709A	RK 22K 1/6W J			
612,613			R641	OBT9731A	RK 180K 1/6W J			
614,621			R643	OBT2444Y	RM 76.8K 1/4W F			
626,627			R646	OBT2457Y	RM 100K 1/4W F			
629,630			R647	OBT9305A	RM 100K 1/4W F			
631,633			R648,654	OBT5671A	RK 2.2M 1/4W J			
635			737					
Q602,603	OBT1872A	TR 2SC945L (P,Q)	R650	OBT9472A	RM 220K 1/4W F			
604,605			R655,656	OBT9315A	RM 332K 1/4W F			
608,617			R657	OBT2420A	RM 47.5K 1/4W F			
618,619			R658	OBT2475Y	RM 150K 1/4W F			
622,623			R663	OBT5621A	RK 120K 1/4W J			
628,632			R664	OBT5626A	RK 150K 1/4W J			
634,636			R669	OBT9729A	RK 150K 1/6W J			
Q609	OBT06316A	TR 2SD882 (P,Q)	R677,684	OBT1889A	RK 100K 1/4W J			
Q610	OBT06303A	TR 2SB772 (P,Q)	685,686					
Q615	OBT06066A	TR 2SD471 (L,M)	688,705					
Q616	OBT06069A	TR 2SB564 (L,M)	714,715					
Q624,625	OBT6372A	TR 2SA953 (K,L)	716,723					
D601,612	OBT6181A	SiD 1SS53	R687	OBT9695A	RK 5.6K 1/6W J			
613,620			R692	OBT9677A	RK 1K 1/6W J			
621,622			R700	OBT9733A	RK 220K 1/6W J			
625			R701,702	OBT9719A	RK 56K 1/6W J			
			707					

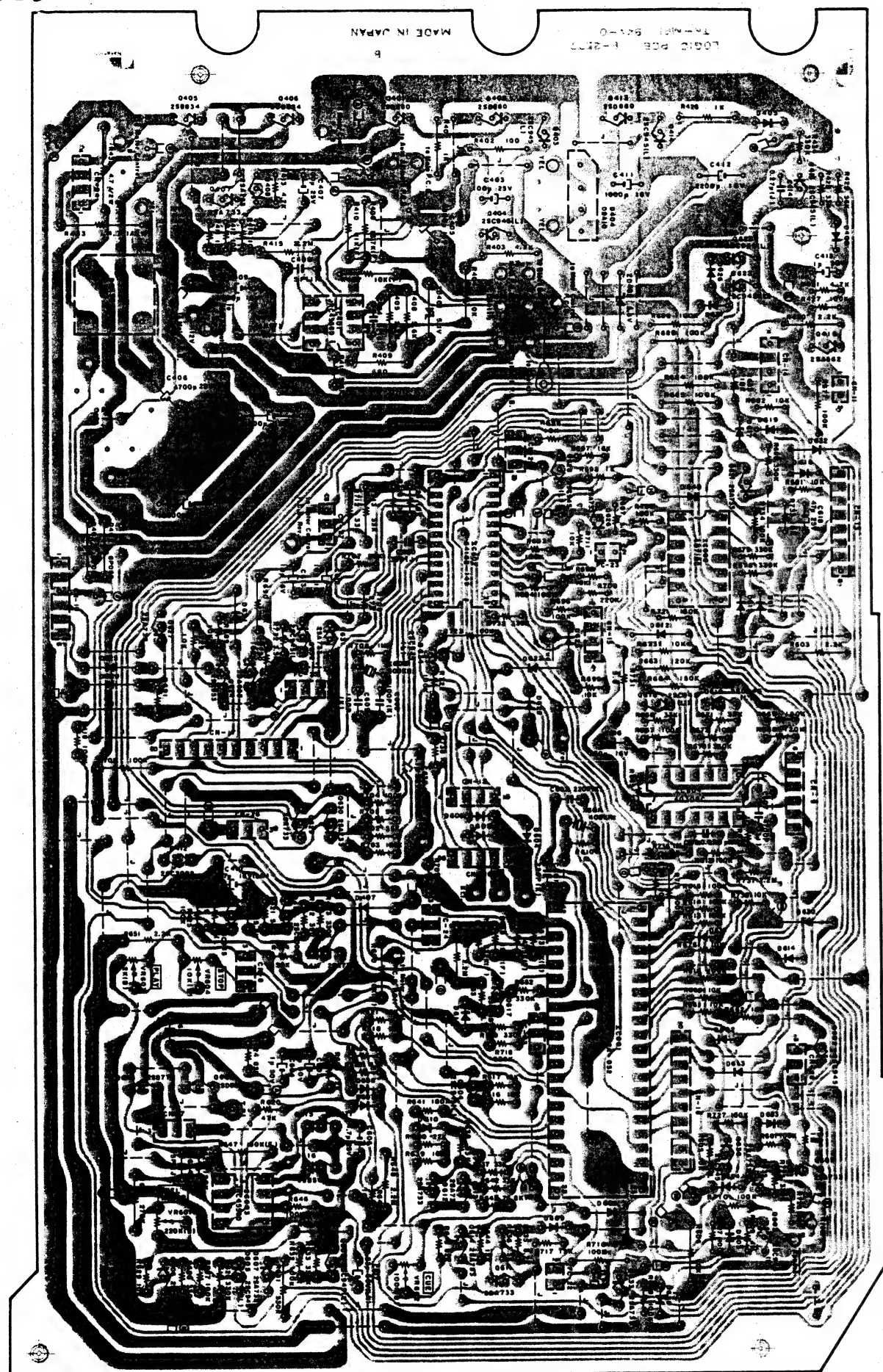


Fig. 6.14.1 Serial No.: A80102201 -

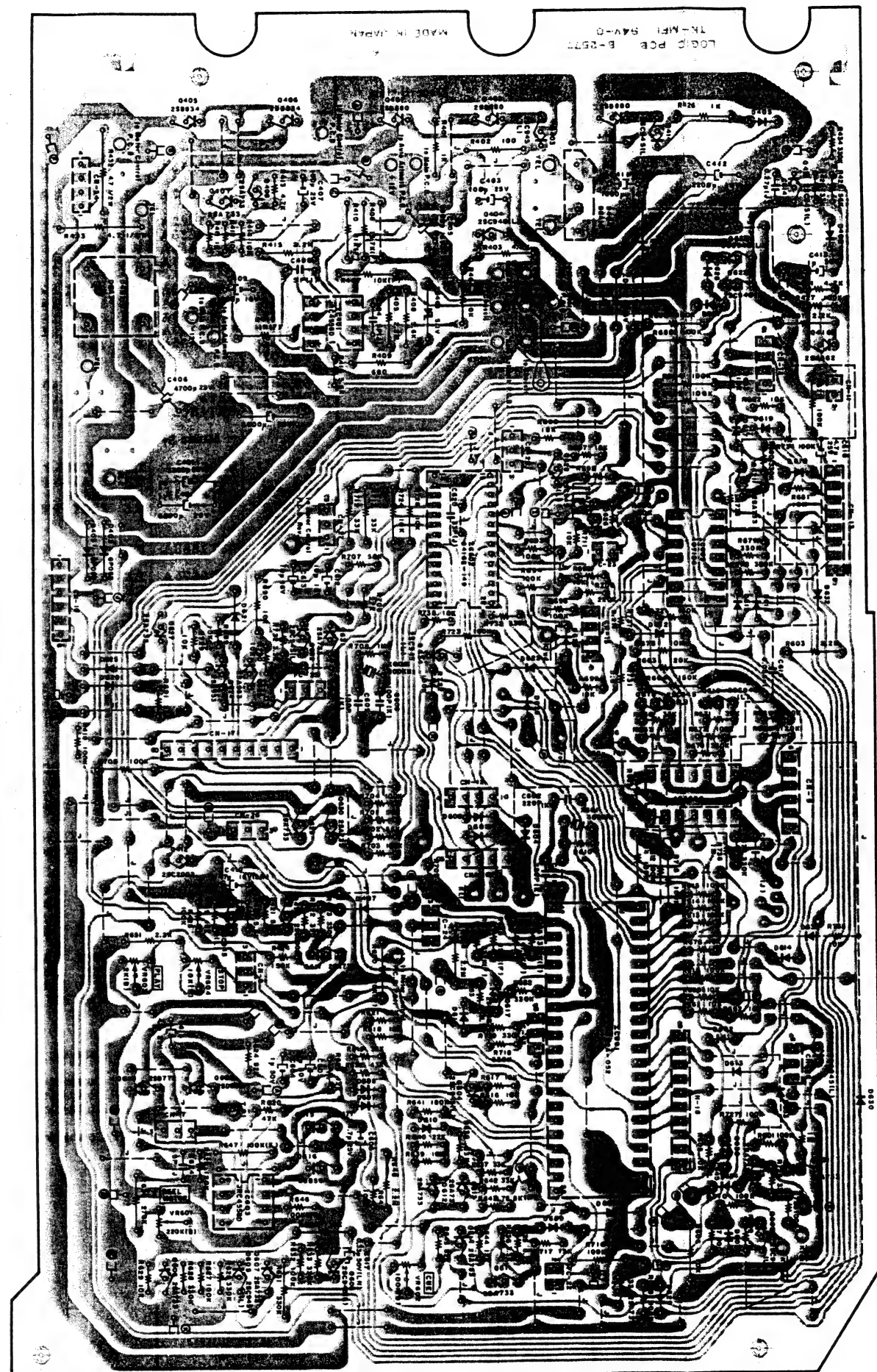


Fig. 6.14.2 Serial Nos: A80101001 - A80102200

6.15. Auto Azimuth P.C.B. Assy

Schematic Ref. No.	Part No.	Description	Schematic Ref. No.	Part No.	Description	Schematic Ref. No.	Part No.	Description
	BA04879A	Auto Azimuth P.C.B. Assy	D821-827	OBT6398A	SID 1SS176 (21)	R805,807		
	— Tone Osc. —		832-835			903,904		
IC721	OB06127A	IC RC4559D	840			905		
IC722	OB06219A	IC μ PD4081BC	842-846			R706,806	OBT5615A	RK 22K 1/4W J
Q721	OBT1872A	TR 2SC945L (P,Q)	848,849			901		
D721,722	OBT6181A	SID 1SS53	850,851			R708,711	OBT1857A	RK 1K 1/4W J
L721	OB03919B	Inductor 36mH	D841	OB06181A	SID 1SS53	808,811		
VR721	OB07269A	Semi-fixed VR 50K	VR822	OB07269A	Semi-fixed VR 50K	R709,809	OBT1682A	RK 6.8K 1/4W J
VR722	OB07270A	Semi-fixed VR 20K	VR823,824	OB07256A	Semi-fixed VR 10K	R710,810	OBT5625A	RK 220K 1/4W J
R721,722	OBT9315A	RM 332K 1/4W F	R821	OB22512Y	RM 316K 1/4W F	R712,812	OBT9432A	RM 8.25K 1/4W F
723			R822,830	OB22265Y	RM 2.2K 1/4W F	R713,714	OBT5627A	RK 330K 1/4W J
R724	OBT9583A	RM 97.6K 1/4W F	R823,831	OB22457Y	RM 100K 1/4W F	813,814		
R725,726	OBT1889A	RK 100K 1/4W J	R824,832	OB22256Y	RM 1.8K 1/4W F	R715,815	OBT9510A	RM 66.5K 1/4W F
732			R825,828	OBT9701A	RK 10K 1/6W J	R716,816	OBT9305A	RM 100K 1/4W F
R727	OBT5615A	RK 22K 1/4W J	832,836			R718,818	OBT5577A	RK 330 1/4W J
R728	OBT5627A	RK 330K 1/4W J	847,848			R902	OBT9709A	RK 22K 1/6W J
R729,730	OBT5508A	RK 56K 1/4W J	R829	OB22507Y	RM 287K 1/4W F	C701,703	OBT1405A	CE 1 μ 50V
731			R838,839	OBT9725A	RK 100K 1/6W J	704,801		
R733	OBT9527A	RK 130K 1/4W J	843,844			803,804		
R734	OBT5676A	RK 390K 1/4W J	862,863			C702,802		
R735	OBT1682A	RK 6.8K 1/4W J	871,872			C705,805		
R736	OBT5622A	RK 2.2K 1/4W J	877,881			C901		
C721,722	OBT1400A	CE 100 μ 16V	882,883					
C723	OBT9836A	CP 360P 100V J	884,898					
C724	OBT9538A	CP 0.018 μ 100V G	899,920					
C725	OBT9861A	CF 0.027 μ 50V J	922,928					
C726	OBT9865A	CF 0.056 μ 50V J	930,931					
C727	OB09302A	C 100P 100V J	R840,842	OBT9749A	RK 1M 1/6W J			
C728	OBT9868A	CF 0.1 μ 50V J	854,856					
C729	OBT9860A	CF 0.022 μ 50V J	894,921					
C730	OBT9848A	CF 2200P 50V J	924,925					
C731	OBT9322A	CP 330P 100V J	R841	OBT9707A	RK 18K 1/6W J			
	— Fader —		R845,846	OBT9733A	RK 220K 1/6W J			
IC741	OB06216A	IC μ PC4556C	849,852					
Q741,744	OB06013A	TR 2SA733 (P,Q)	890,928					
Q742,743	OBT1872A	TR 2SC945L (P,Q)	R850,855					
746			R853					
ZD741	OBT6290A	ZD 5.6V RD5.6EB2	R869					
D741,742	OBT6181A	SID 1SS53	R873					
743,744			R874					
R741,743	OBT5676A	RK 390K 1/4W J	R875,929					
746			R876,878					
R742,744	OBT5640A	RK 180K 1/4W J	R879					
R745,763	OBT5692A	RK 68K 1/4W J	R880					
R747	OBT5641A	RK 47K 1/4W J	R891					
R748,751	OBT1888A	RK 10K 1/4W J	R892,923					
754,765			927					
R749,750	OBT5668A	RK 82K 1/4W J	R926					
R752	OBT1889A	RK 100K 1/4W J	R932					
R753	OBT5621A	RK 120K 1/4W J	R935					
R755	OBT743A	RK 27K 1/4W J	R936					
R756,764	OBT5622A	RK 2.2K 1/4W J	C821,826					
767			C823,828					
R757	OBT1857A	RK 1K 1/4W J	C824,829					
R758	OBT5691A	RK 390 1/4W J	C831,856					
R759	OBT5576A	RK 470 1/4W J	C832					
R760,766	OBT1887A	RK 5.6K 1/4W J	C833,834					
R761	OBT1681A	RK 3.3K 1/4W J	C835,858					
R762	OBT5627A	RK 330K 1/4W J	C841,842					
C741	OBT1674A	CE 10 μ 25V	C845					
C742	OBT9844A	CF 1000P 50V J	C846					
C743	OBT1409A	CE 47 μ 25V	C853					
C744	OBT9852A	CF 4700P 50V J	C854,855					
	— Azimuth —		C857					
IC821	OB06443A	IC NJM082D	C859,860					
IC822	OB06387A	IC NJM2043DD	CN5					
IC823	OB06216A	IC μ PC4556C	CN6					
IC824	OB06178A	IC μ PD4011BC						
IC825	OB06358A	IC μ PD4013BC						
IC826	OB06144A	IC μ PD4066BC						
IC827	OB06124B	IC RC4558D						
Q821,822	OBT6013A	TR 2SA733 (P,Q)						
825,831								
Q823,824	OBT1872A	TR 2SC945L (P,Q)						
828,829								
830,843								
Q832	OB06066A	TR 2SD471 (L,M)						
Q833	OB06069A	TR 2SB564 (L,M)						
Q840	OBT6299A	TR 2SC2878						
ZD821	OBT6230A	ZD 5.1V RD5.1EB2						
ZD822	OBT6353A	ZD 6.2V RD6.2EB2						

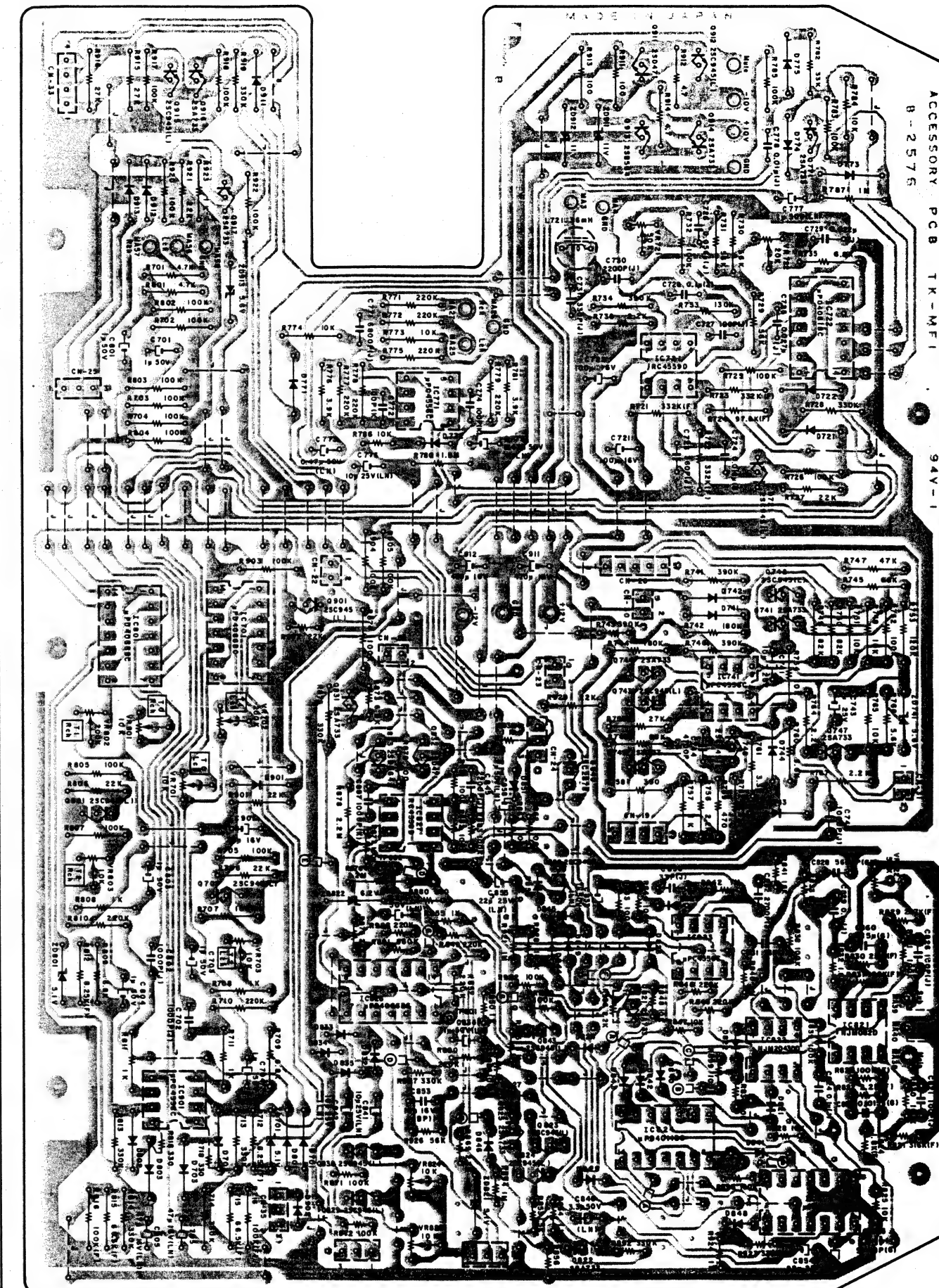


Fig. 6.15.1 Serial No.: A80102201 -

Schematic Ref. No.	Part No.	Description	Schematic Ref. No.	Part No.	Description	Schematic Ref. No.	Part No.	Description
	BA04870A	Main P.C.B. Assy	C517,617	OB09410A	CP 2200P 100V G	D102,202	OB06398A	SiD 1SS176
	— PB Eq. Amp. —		C518,618	OB09322A	CP 330P 100V J	L101,201	OB06676A	Inductor 36mH G
			C519,619	OB09286A	CC 470P 50V K	R101,201	OB06889A	RK 100K 1/4W J
			CN2	OB02281A	4P-T Post	R102,202	OB01857A	RK 1K 1/4W J
IC301,501	OB11005A	IC NJM072DE		— Bias Osc. —		R103,203	OB05622A	RK 2.2K 1/4W J
601			Q302	OB06101A	TR 2SA733 (P,Q)	R104,204	OB05743A	RK 27K 1/4W J
IC502,602	OB06144A	IC μ PD4066BC	Q303	OB06202A	TR 2SA562TM (Y)	R106,206	OB01681A	RK 3.3K 1/4W J
IC701	OB06443A	IC NJM082D	T301	OB06718A	Bias Osc. Unit	R107,207	OB09677A	RK 1K 1/6W J
Q501,502	OB06376A	FET 2SK170 (GR)	R311	OB01888A	RK 10K 1/4W J	R108,120	OB09701A	RK 10K 1/6W J
601,602			R312	OB05692A	RK 68K 1/4W J	208,220		
701,702			R313,314	OB09936A	RF 10 1/2W J	R109,110	OB09502A	RM 1M 1/4W F
ZD301	OB06418A	ZD 8.2V RD8.2JB2	R315	OB05575A	RK 560 1/4W J	209,210		
L501,502	OB06717A	Trap Unit	R316	OB01681A	RK 3.3K 1/4W J	R111,211	OB09197A	RM 820K 1/4W F
601,602			R317	OB05560A	RK 18K 1/4W J	R112,212	OB09766A	RM 2.2M 1/4W F
VR501,502	OB07256A	Semi-fixed VR 10K	R318	OB09701A	RK 10K 1/6W J	R114,214	OB01888A	RK 10K 1/4W J
601,602			R343	OB09661A	RK 220 1/6W J	R115,215	OB22305Y	RM 4.7K 1/4W F
VR701,702	OB32002A	Semi-fixed VR 2K	C311	OB09405A	CP 0.022 μ 100V J	R116,216	OB22351Y	RM 12K 1/4W F
R306	OB05622A	RK 2.2K 1/4W J	C312	OB01400A	CE 100 μ 16V	R117,125	OB09717A	RK 47K 1/6W J
R307	OB09701A	RK 10K 1/6W J	C321	OB09844A	CF 1000P 50V J	128,217		
R308	OB01857A	RK 1K 1/4W J	CN1	OB08656A	2P-T Post	225,228		
R341,342	OB09737A	RK 330K 1/6W J		— Line Input —		R118,218	OB09673A	RK 680 1/6W J
R501,511	OB09725A	RK 100K 1/6W J	Q121,122	OB01872A	TR 2SC945L (P,Q)	R119,219	OB09683A	RK 1.8K 1/6W J
601,611			123,221			R121,221	OB22443Y	RM 75K 1/4W F
701,707			222,223			R123,223	OB09737A	RK 330K 1/6W J
R502,512	OB22296Y	RM 3.92K 1/4W F	301			R124,224	OB05668A	RK 82K 1/4W J
602,612			L102,202	OB06690A	L-C Block	R126,130	OB05627A	RK 330K 1/4W J
702,708			VR301	OB07257A	Semi-fixed VR 100K	226,230		
R503,513	OB22104Y	RM 80.6 1/4W F	R181,281	OB09733A	RK 220K 1/6W J	R127,129	OB05676A	RK 390K 1/4W J
603,613			R182,282	OB09653A	RK 100 1/6W J	227,229		
703,709			R183,283	OB09725A	RK 100K 1/6W J	R131,132	OB09162A	RF 82 1/4W J
R504,514	OB09785A	RK 4.7M 1/4W J	303			231,232		
604,614			R184,284	OB09705A	RK 15K 1/6W J	R133,233	OB09705A	RK 15K 1/6W J
704,710			R185,285	OB09677A	RK 1K 1/6W J	R134,234	OB22326Y	RM 6.98K 1/4W F
R505,515	OB22512Y	RM 316K 1/4W F	301,302			R135,235	OB22545A	RM 10M 1/4W F
605,615			R186,286	OB09687A	RK 2.7K 1/6W J	R136,236	OB09735A	RK 270K 1/6W J
705,711			R187,287	OB09698A	RK 7.5K 1/6W J	C101,115	OB09814A	CE 1 μ 50V (LN)
R506,516	OB22353Y	RM 12.4K 1/4W F	R188,288	OB05622A	RK 2.2K 1/4W J	201,215		
606,616			R189,289	OB09701A	RK 10K 1/6W J	C103,203	OB09409A	CP 1800P 100V G
706,712			R190,290	OB05743A	RK 27K 1/4W J	C104,105	OB09857A	CF 0.012 μ 50V J
R507,517	OB09661A	RK 220 1/6W J	R191	OB05692A	RK 68K 1/4W J	204,205		
607,617	OB09669A	RK 470 1/6W J	R291	OB05621A	RK 120K 1/4W J	C106,206	OB09863A	CF 0.039 μ 50V J
R508,518			R304	OB09709A	RK 22K 1/6W J	C108,208	OB09240A	CP 0.033 μ 100V G
608,618			R305	OB09697A	RK 6.8K 1/6W J	C109,209	OB09852A	CF 4700P 50V J
R509,519	OB01682A	RK 6.8K 1/4W J	C161,261	OB09814A	CE 1 μ 50V (LN)	C110,114	OB09812A	CE 10 μ 16V
609,619			C162,262	OB09247A	C 220P 50V J	210,214		
R715,716	OB09653A	RK 100 1/6W J	C163,263	OB09932A	CE 22 μ 16V (LN)	C111,211	OB09861A	CF 0.027 μ 50V J
C304	OB01412A	CE 10 μ 16V	C164,264	OB09849A	CF 2700P 50V J	C112,212	OB09191A	CP 4700P 100V G
C305	OB01400A	CE 100 μ 16V	C165,265	OB09845A	CF 1200P 50V J	C116,216	OB09864A	CF 0.047 μ 50V J
C325,326	OB09291A	CC 0.022 μ 50V Z	C166,266	OB09288A	CC 1000P 50V K	C117,217	OB09866A	CF 0.068 μ 50V J
C501,504	OB09933A	CE 2.2 μ 50V (LN)	C167,267	OB09270A	CP 470P 100V J	C118,122	OB09862A	CF 0.033 μ 50V J
601,604			C301,302	OB01400A	CE 100 μ 16V	C119,121		
701,703			C303	OB09850A	CF 3300P 50V J	129,130	OB09868A	CF 0.1 μ 50V J
C502,505	OB09312A	CP 0.01 μ 100V G	C320	OB09290A	CC 0.01 μ 50V Z	219,221		
602,605			Cds301	OB06325B	Photocoupler MCD7214F	229,230		
702,704				— Line Amp. —		C120,220	OB09870A	CF 0.15 μ 50V J
C503,506	OB09851A	CF 3900P 50V J	IC303	OB011004A	IC NJM2041DD	C123,223	OB09872A	CF 0.22 μ 50V J
603,606			Q505,605	OB01872A	TR 2SC945L (P,Q)	C124,125	OB05885A	CE 100 μ 10V
705			D121,221	OB06398A	SiD 1SS176	224,225		
CN3	OBL8654A	4P-T Post	L504,604	OB06676A	Inductor 36mH G	C126,226		
CN4	OBL8642A	6P-T Post	R541,543	OB05625A	RK 220K 1/4W J	C127,227	OB09783A	CP 820P 100V J
	— Rec. Eq. Amp. —		641,643			C128,228	OB09856A	CF 0.01 μ 50V J
IC302	OB06387A	IC NJM2043DD	R542,546				OB09302A	C 100P 50V J
Q503,504	OB06299A	TR 2SC2878	642,646				— Decoder —	
603,604			R544,644				OB06382A	IC NE562
L503,603	OB00068A	Trap Coil 10.5mH	R545,645				OB06457A	IC NJM072DD
L504,604	OB06705A	Trap Coil 1.05mH	R547,647				OB01872A	TR 2SC945L (P,Q)
R521,529	OB09705A	RK 15K 1/6W J	R548,648					
621,629			C521,621				OB06232A	ZD 9.1V RD9.1EB2
R522,622	OB05560A	RK 18K 1/4W J	C522,622					
R523,526	OB09731A	RK 180K 1/6W J	C523,623				OB06181A	SiD 1SS53
623,626				— Encoder —			OB06398A	SiD 1SS176
R524,624	OB09653A	RK 100 1/6W J	IC101,201	OB06382A	IC NE652		OB01889A	RK 100K 1/4W J
R527,627	OB22410Y	RM 39.2K 1/4W F	IC102,202	OB06457A	IC NJM072DD			
R528,628	OB22296Y	RM 3.92K 1/4W F	Q101,102	OB01872A	TR 2SC945L (P,Q)		OB01857A	RK 1K 1/4W J
R530,630	OB09673A	RK 680 1/6W J	103,104				OB09588A	RK 2.4K 1/4W J
R531,631	OB22247Y	RM 1.5K 1/4W F	105,201				OB05615A	RK 22K 1/4W J
R532,632	OB01888A	RK 10K 1/4W J	202,203				OB22221Y	RM 845 1/4W F
R533,633	OB05936A	RK 10 1/4W J	204,205					
R534,634	OB09749A	RK 1M 1/4W J	204,205					
C327,328	OB01405A	CE 1 μ 50V	ZD101,102					
C511,611	OB09862A	CF 0.033 μ 50V J	201,202					
C512,520	OB09814A	CE 1 μ 50V (LN)	D101,103					
612,620			201,203					
C513,613	OB09815A	CE 47 μ 6.3V (LN)						
C514,614	OB09867A	CF 0.082 μ 50V J						
C515,615	OB09854A	CF 6800P 50V J						
C516,616	OB09850A	CF 3300P 50V J						

6.16. Main P.C.B. Assy

Schematic Ref. No.	Part No.	Description
R155,255	OBT9685A	RK 2.2K 1/6W J
R156,256	OBT9713A	RK 33K 1/6W J
R157,257	OBT9693A	RK 4.7K 1/6W J
R158,258	OBT9701A	RK 10K 1/6W J
R159,163	OBT5641A	RK 47K 1/4W J
259,263		
R160,260	OBT5668A	RK 82K 1/4W J
R162,164	OBT5676A	RK 390K 1/4W J
262,264		
R166,167	OB09162A	RF 82 1/4W J
266,267		
R168,268	OBT9749A	RK 1M 1/6W J
C131,231	OBT9933A	CE 2.2μ 50V (LN)
C133,233	OBT9852A	CF 4700P 50V J
C134,234	OBT9240A	CP 0.033μ 100V G
C135,140	OBT1412A	CE 10μ 16V
235,240		
329		
C136,144	OBT9866A	CF 0.068μ 50V J
236,244		
C137,237	OBT9814A	CE 1μ 50V (LN)
C139,239	OB09191A	CP 4700P 100V G
C141,241	OBT9286A	CC 470P 50V K
C142,242	OBT9856A	CF 0.01μ 50V J
C143,243	OBT9864A	CF 0.047μ 50V J
C145,149	OBT9862A	CF 0.033μ 50V J
245,249		
C146,148	OBT9868A	CF 0.1μ 50V J
246,248		
C147,247	OBT9870A	CF 0.15μ 50V J
C150,250	OBT9872A	CF 0.22μ 50V J
C151,152	OBT5885A	CE 100μ 10V
251,252		
C153,253	OB09302A	C 100P 50V J
C154,254	OBT9262A	CP 3000P 100V J
C310	OBT1405A	CE 1μ 50V
— Logic Interface —		
Q304,307	OBT1872A	TR 2SC945L (P,Q)
308		
Q305,306	OBT6013A	TR 2SA733 (P,Q)
D301,302	OBT6181A	SID 1SS53
304,305		
313,314		
D303,311	OBT6398A	SID 1SS176
312		
R318,320	OBT1889A	RK 100K 1/4W J
322,326		
R319	OBT5509A	RK 33K 1/4W J
R321,331	OBT5641A	RK 47K 1/4W J
332		
R323	OBT1888A	RK 10K 1/4W J
R324	OBT5743A	RK 27K 1/4W J
R325	OBT1857A	RK 1K 1/4W J
R327	OBT9717A	RK 47K 1/6W J
R328	OBT5575A	RK 560 1/4W J
R333,334	OBT9749A	RK 1M 1/6W J
C313,314	OB01406A	CE 2200μ 16V
C322,323	OBT9292A	CC 0.1μ 50V Z
324		
— Headphone Amp. —		
IC304	OB06217A	IC NJM4560D
Q506,606	OB06066A	TR 2SD471 (L,M)
Q507,607	OB06069A	TR 2SB564 (L,M)
R551,651	OBT9653A	RK 100 1/6W J
R552,553	OBT1889A	RK 100K 1/4W J
652,653		
R554,654	OBT9645A	RK 47 1/6W J
R555,655	OB09331A	RF 8.2 1/4W J
C531,631	OBT9277A	CC 10P 50V J
C315,316	OBT1405A	CE 1μ 50V
— Miscellaneous —		
CN21,37	OB02575B	Main P.C.B.
CN36	OB02348A	3P-JP Connector
FC21	OB02350A	5P-JP Connector
FC30	OB05343B	3P Flat Cable
FC31	OB05334B	2P Flat Cable
FC32,47	OB82032A	2P Flat Cable
FC33	OB05342B	3P Flat Cable
FC37	OB05356B	4P Flat Cable
FC46	OB05341B	3P Flat Cable
FC48	OB05344B	3P Flat Cable
FC49	OB05347B	3P Flat Cable
	OB05335B	2P Flat Cable
	OB08515A	Insu-Lock (5)

Schematic Ref. No.	Part No.	Description
	OB08676B	Heat Sink A304 (1)
	OM04238A	Label CN-26 (1)
	OM04239A	Label CN-27 (1)
	OM04439A	Label CN-30 (1)
	OM04247A	Label CN-31 (1)
	OM04248A	Label CN-32 (1)
	OM04249A	Label CN-33 (1)
	OE00612A	M3x6 @ Pan (2A)
		(2)
	OE00857A	BT 3x6 @ Binding (Chromate) (2)
	OJ03834C	Fuse P.C.B. Holder (1)

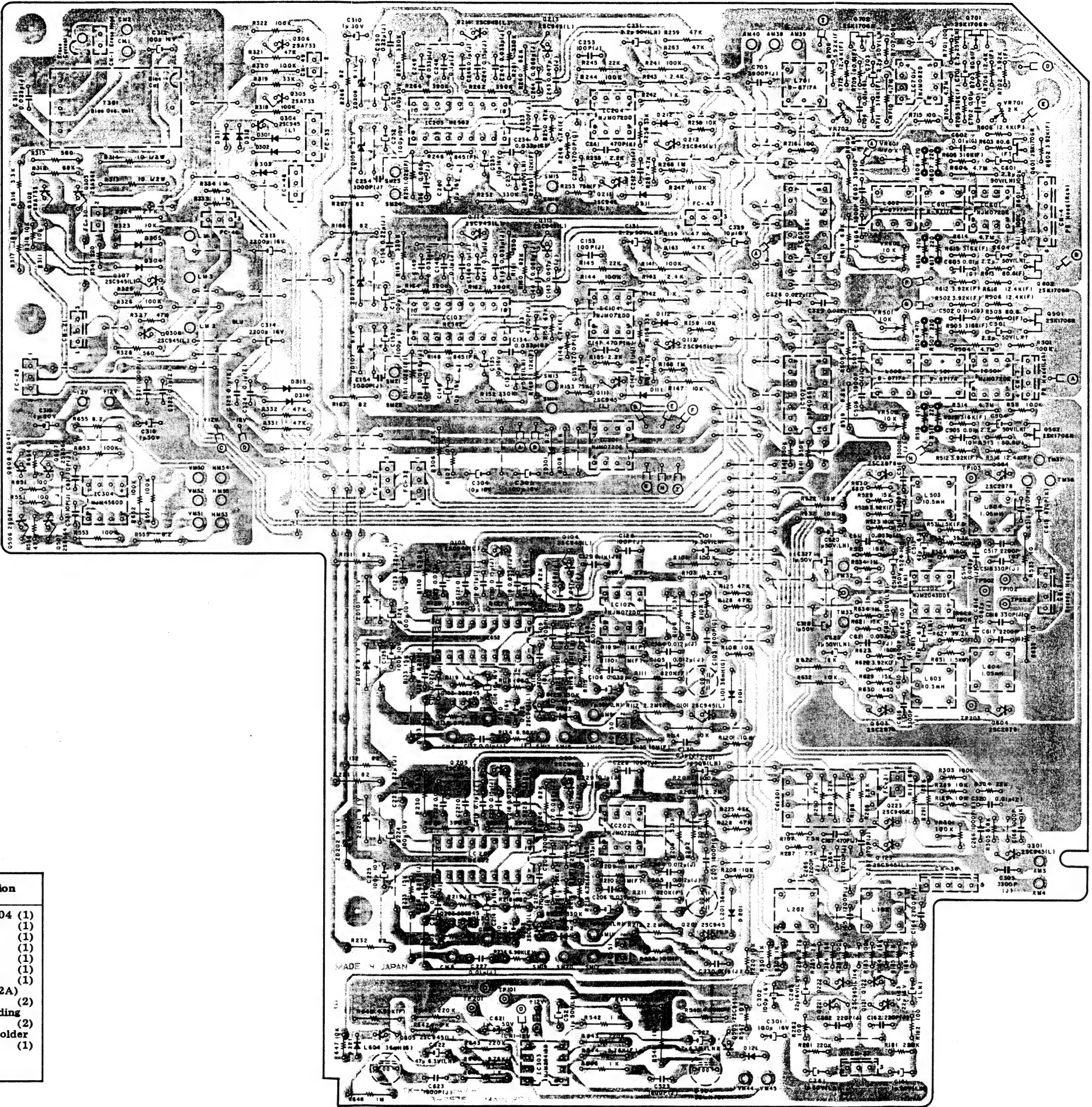


Fig. 6.16.1 Serial No.: A80102201 -

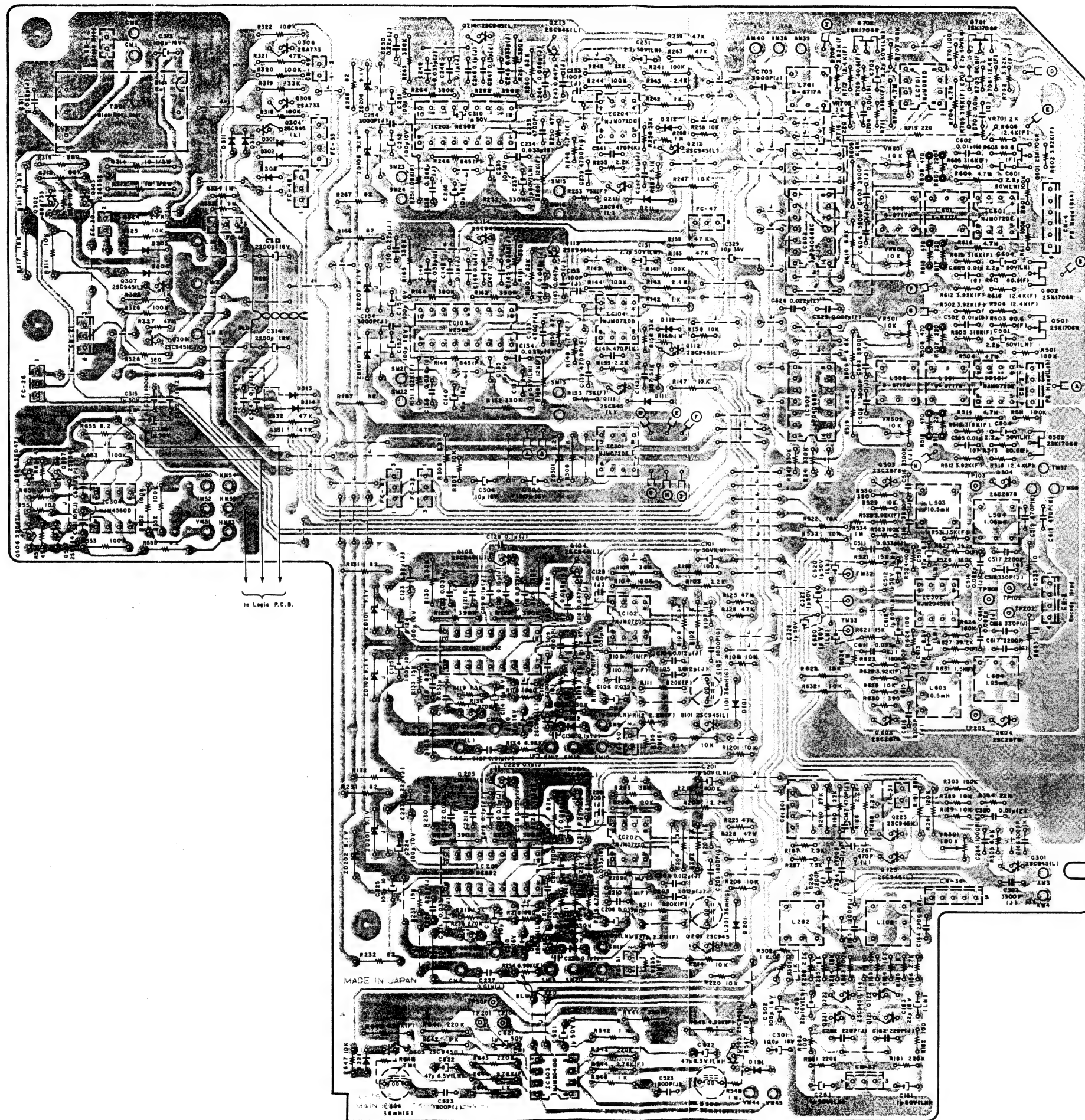


Fig. 6.16.2 Serial Nos.: A80101001 - A80102200

7. SCHEMATIC DIAGRAMS

7.1. Attention to Servicemen

(1) **Parts Replacement**
Following parts shall be replaced with the specified ones.
Refer to the parts list.

- (a) **Power Supply Circuit**
Power Cord
Power Transformer: T1
- (b) **Power Switch P.C.B. Ass'y**
Power Switch: SW1
Spark Killer: M2
- (c) **Fuse P.C.B. Ass'y**
Fuses: F01, 02, 03
- (d) **Logic P.C.B. Ass'y**
Power Transistors: Q401, 402, 405, 406, 410, 412, 413, 416, 609, 610, 615, 616
Diode Bridges: D401, 404
Fail Safe Type Resistors: R432, 433, 731
- (e) **Main P.C.B. Ass'y**
Power Transistors: Q303, 506, 606
Fail Safe Type Resistors: R131, 132, 166, 167, 231, 232, 266, 267, 313, 314, 555, 655
- (f) **Auto Azimuth P.C.B. Ass'y**
Power Transistors: Q832, 833, 911, 913
Fail Safe Type Resistors: R911, 912, 913, 914
- (g) **Motor Control P.C.B. Ass'y**
Power Transistors: Q518, 519, 520, 521, 522, 523, 524, 525, 526
Fail Safe Type Resistors: R572, 573, 582, 583
- (h) **Shut-off P.C.B. Ass'y**
Fail Safe Type Resistor: R605
Lamp: PL602
- (i) **Counter Pulse Generator P.C.B. Ass'y**
Fail Safe Type Resistor: R601
Lamp: PL601

(2) Insulation Check

Before returning the repaired Nakamichi DRAGON to a customer, check to insure that the exposed parts are accurately insulated from the AC line by measuring the leakage current or the insulation resistance between them.

7.2. IC Block Diagrams

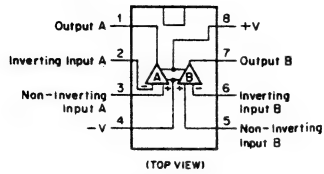


Fig. 7.2.1 Operational Amp. IC 4558D, 4559D, 4560D, 4556C, 2041DD, 2043DD, 082D, 072D

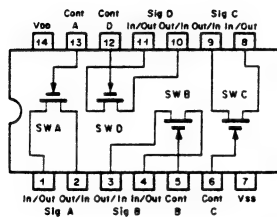


Fig. 7.2.2 Bilateral Switch C-MOS IC μ PD4066BC

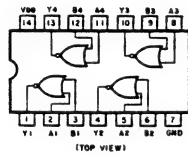


Fig. 7.2.3 NOR Gate C²-MOS IC TC40H002P

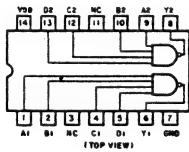


Fig. 7.2.4 NAND Gate C²-MOS IC TC40H020P

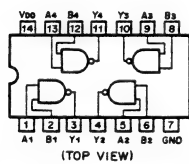


Fig. 7.2.5 NAND Gate C-MOS IC μ PD4011BC

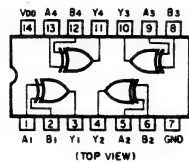


Fig. 7.2.6 Exclusive OR Gate C-MOS IC μ PD4030BC

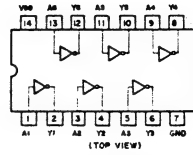


Fig. 7.2.7 Inverter C-MOS IC TC4069UBP

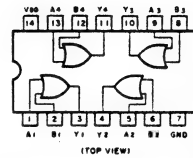


Fig. 7.2.8 OR Gate C-MOS IC μ PD4071BC

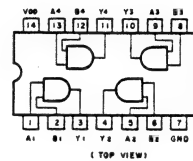


Fig. 7.2.9 AND Gate C-MOS IC μ PD4081BC

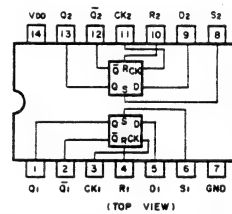


Fig. 7.2.10 D-Type Flip-Flop C-MOS IC μ PD4013BC

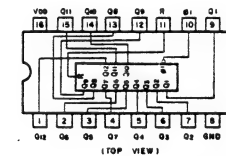


Fig. 7.2.11 Decoder C-MOS IC μ PD4040BC

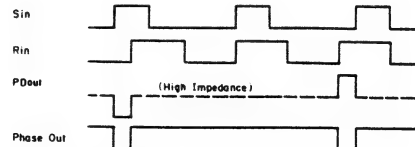
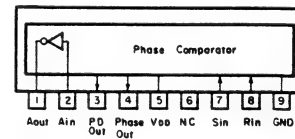


Fig. 7.2.12 Phase Comparator TC5081P

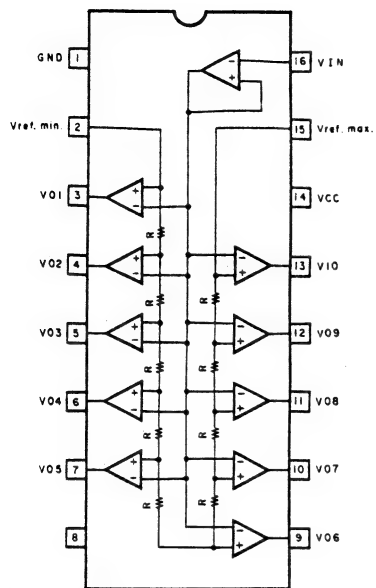


Fig. 7.2.13 Level Meter Driver TA7612AP

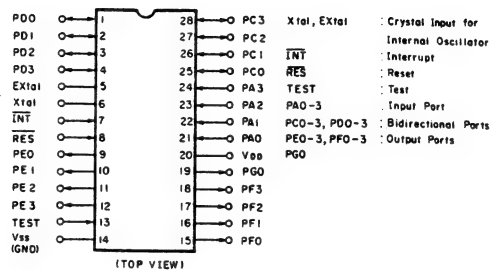
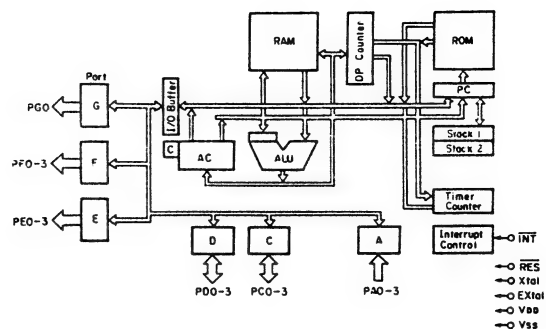


Fig. 7.2.15 4-Bit Micro-processor LM6416E

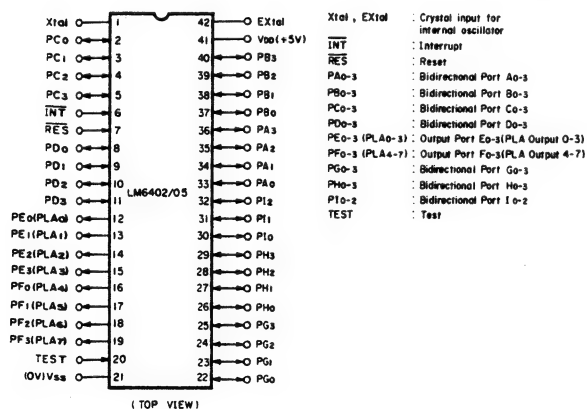
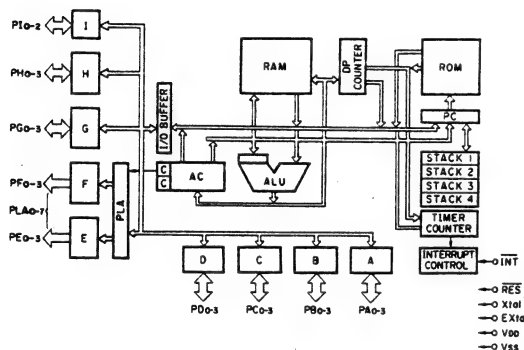
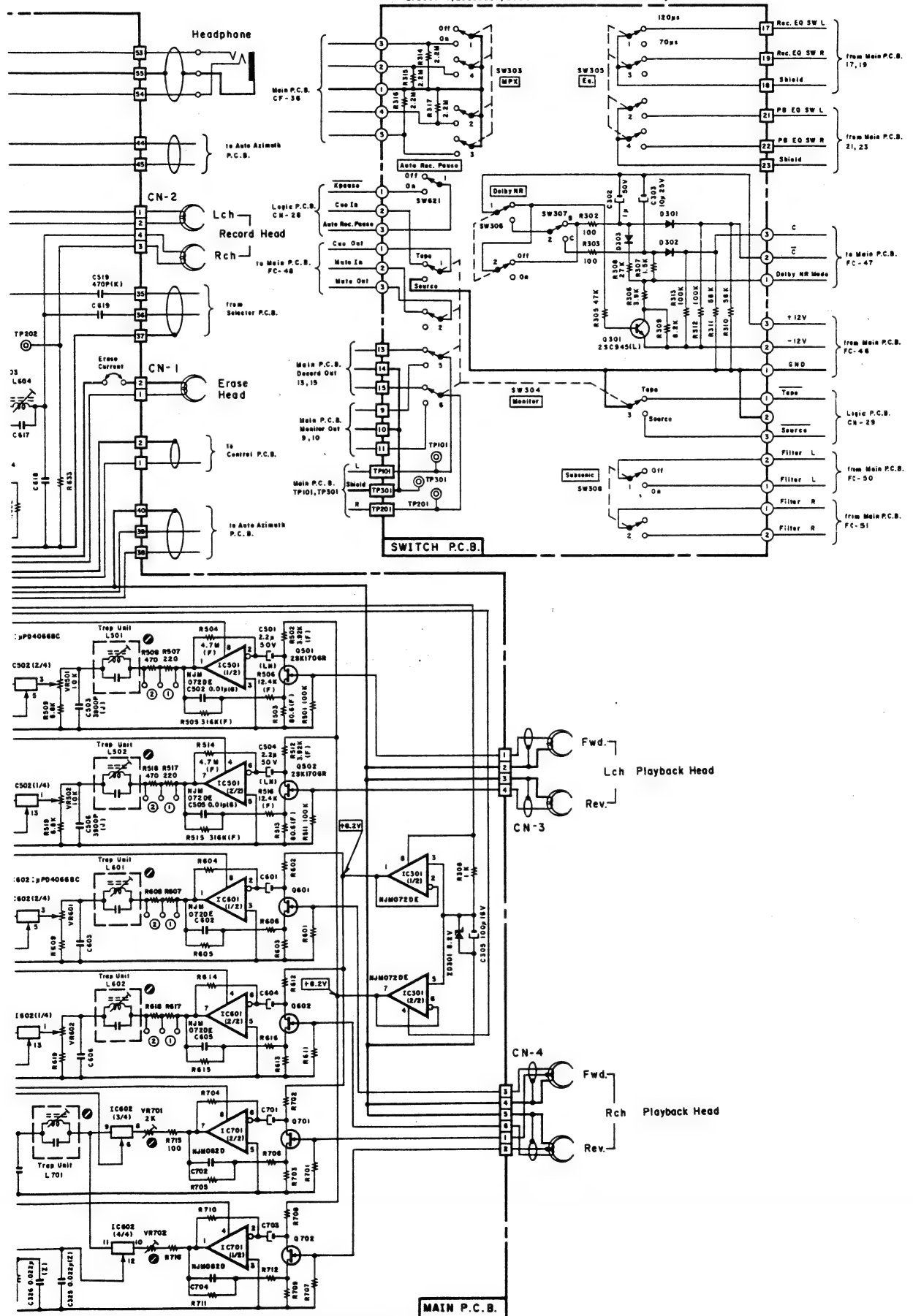


Fig. 7.2.14 4-Bit Micro-processor LM6402A

- Notes: 1. Diode is 1SS53, 1S1555, or 1SS176 unless otherwise specified.
2. Resistor and capacitor marked with * show typical value.

Notes: 1. 2SA733, 2SA6085P, 2SA1048 and 2SA1175 are interchangeable with each other.
2. 2SC945, 2SC5365P, 2SC2458 and 2SC2785 are interchangeable with each other.



7.3. Amplifier Section

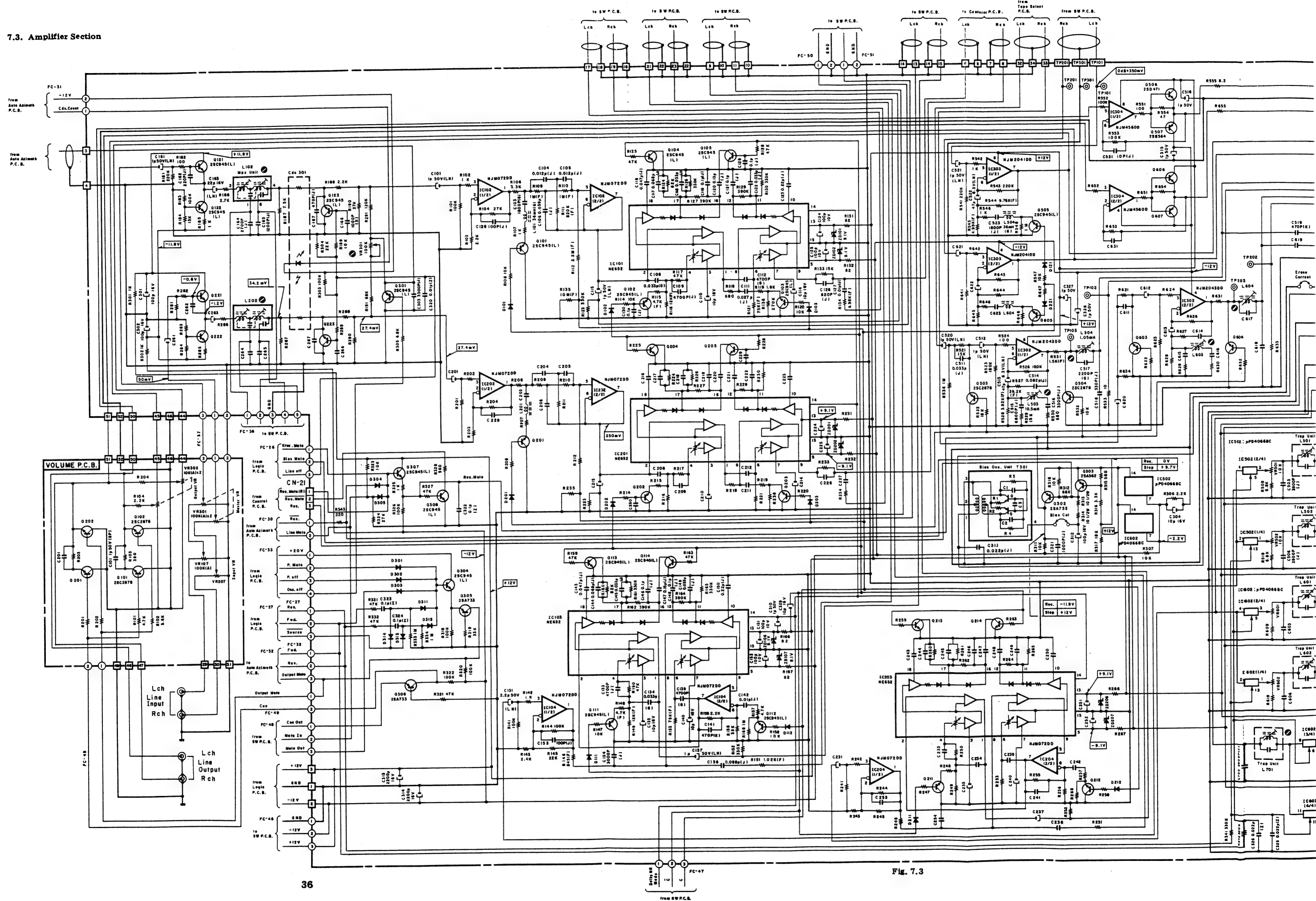


Fig. 7.3

The schematic diagram illustrates the internal wiring of the BlackBox Jack. It features two main ICs: IC722 (4/4) and IC721 (12/1). IC722 is configured as a voltage divider with resistors R735 (6.8K), R730 (54K), and R731 (50K), and capacitors C725 (0.0075 50K) and C726 (0.005 50K). IC721 is configured as a buffer with resistors R732 (100K), R733 (50K), and R734 (50K), and capacitors C727 (0.0075 100K) and C728 (0.005 100K). The circuit is powered by a 12V battery (12V 1000) and a 12V 1000 capacitor. The output is connected to a 12V 1000 capacitor and a 12V 1000 capacitor. The circuit is labeled with component values and pin numbers.

7.4. Auto Azimuth Control Section

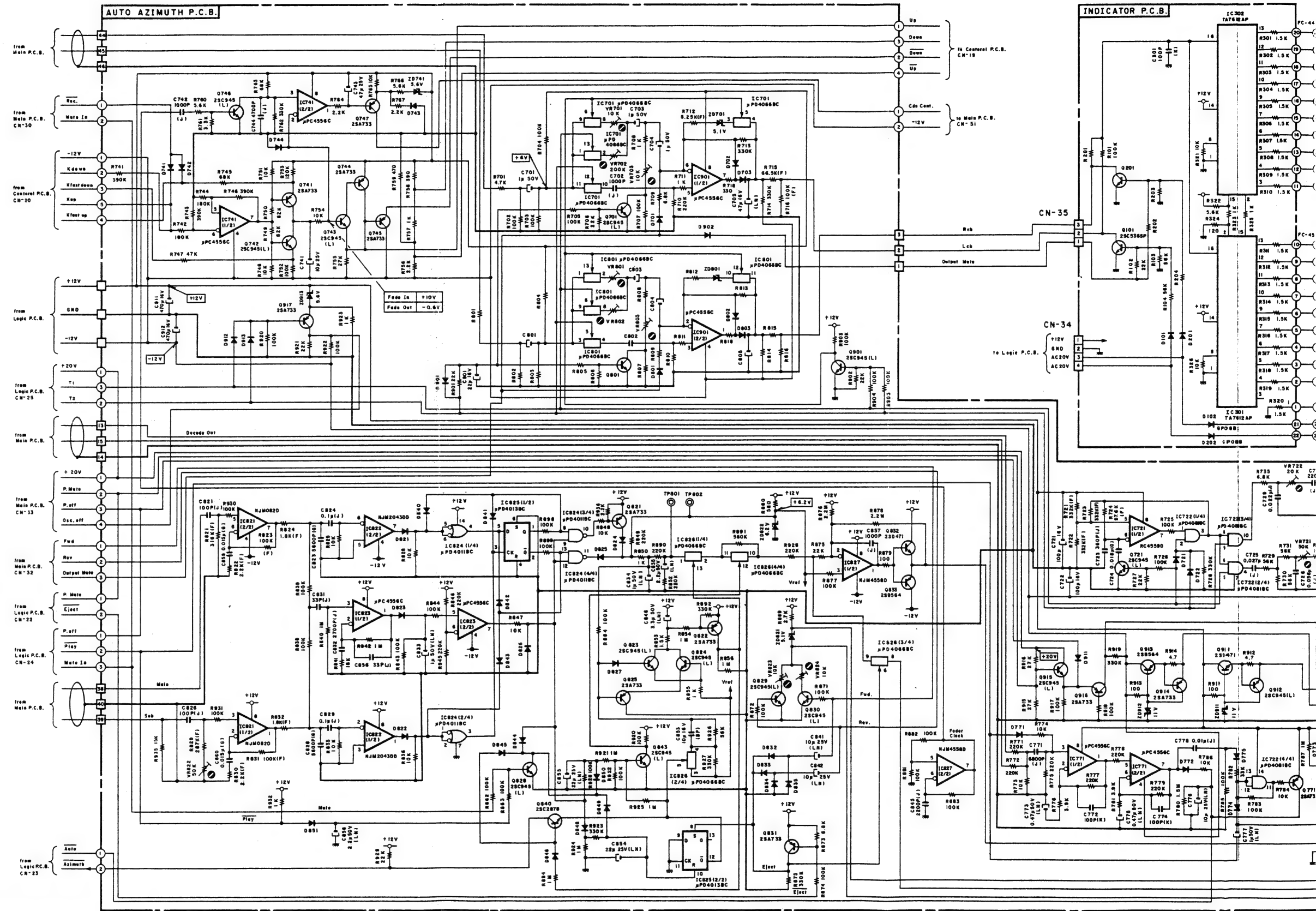
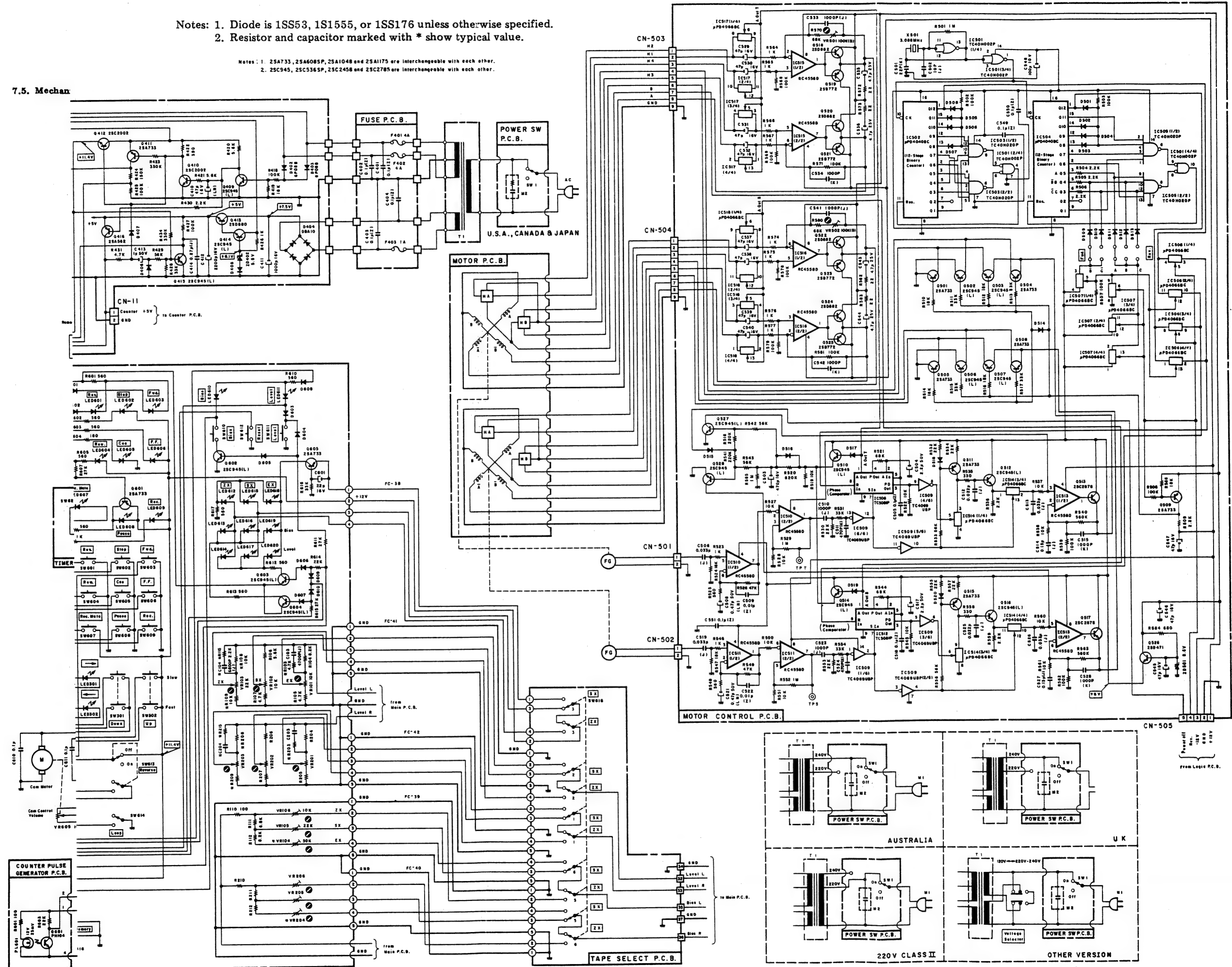


Fig. 7.4

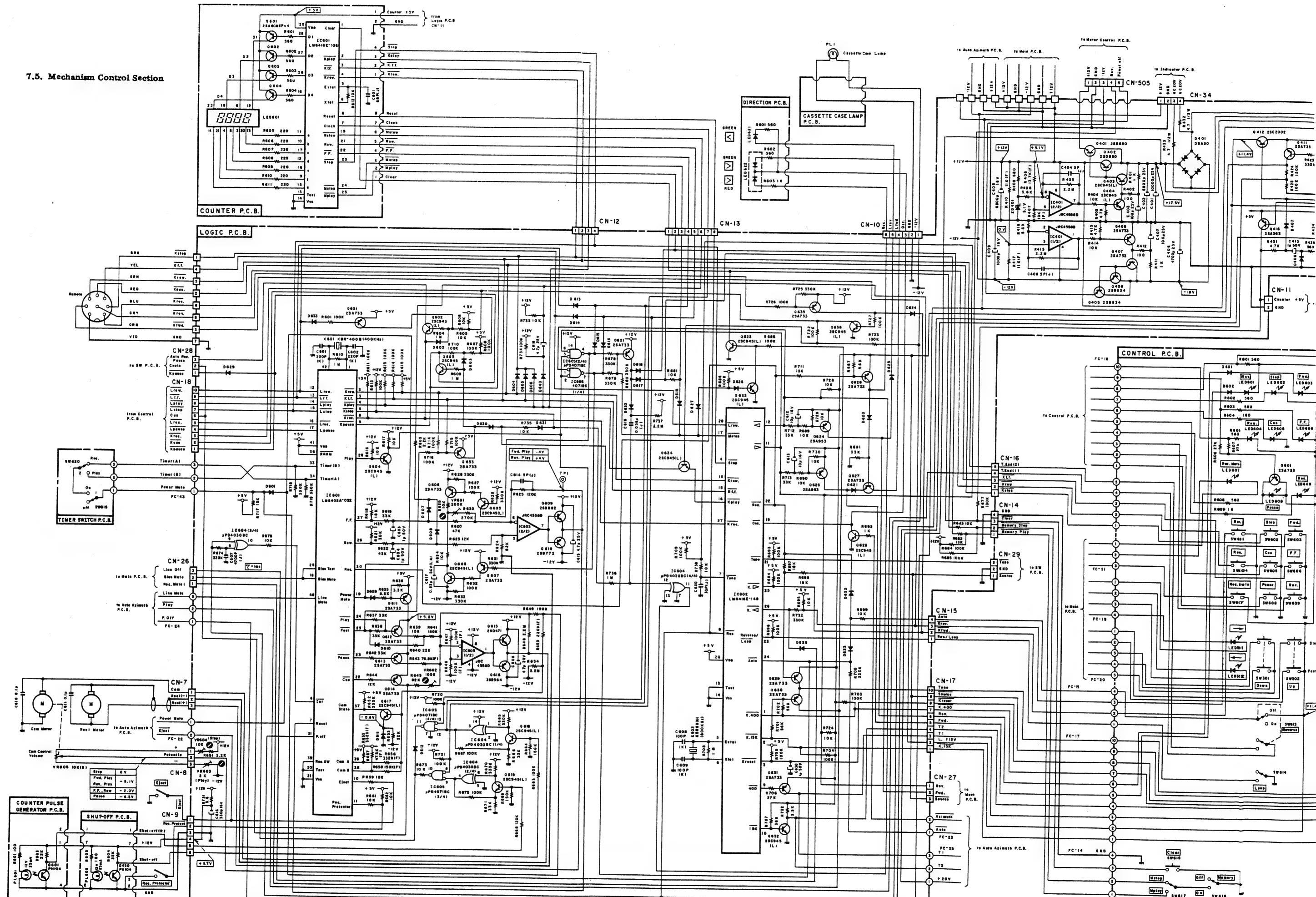
- Notes: 1. Diode is 1SS53, 1S1555, or 1SS176 unless otherwise specified.
2. Resistor and capacitor marked with * show typical value.

Notes: 1. 2S4733, 2S4608P, 2S4104B and 2S4175 are interchangeable with each other.
2. 2SC945, 2SC536SP, 2SC245B and 2SC2785 are interchangeable with each other.

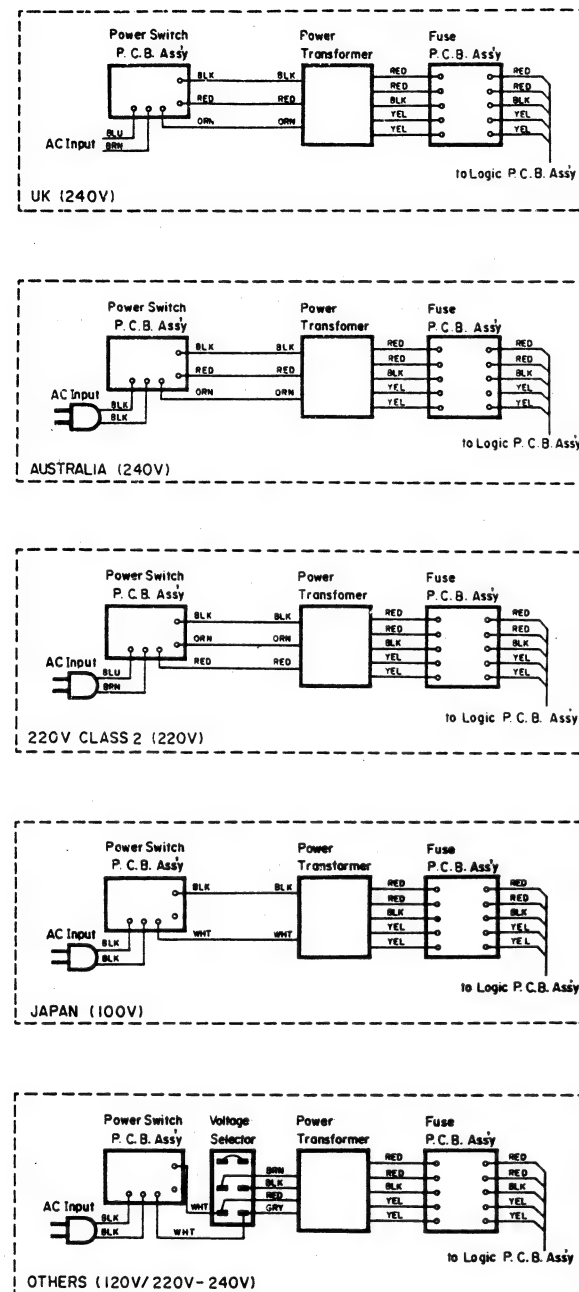
7.5. Mechan



7.5. Mechanism Control Section



8. WIRING DIAGRAM



Notes: 1. Table of wire colors

BRN — Brown
 RED — Red
 ORN — Orange
 YEL — Yellow
 GRN — Green
 BLU — Blue
 VIO — Violet
 GRY — Gray
 WHT — White
 BLK — Black

2. Dip side view of the P.C.B. is illustrated.
 3. Wire tube color is shown in ().

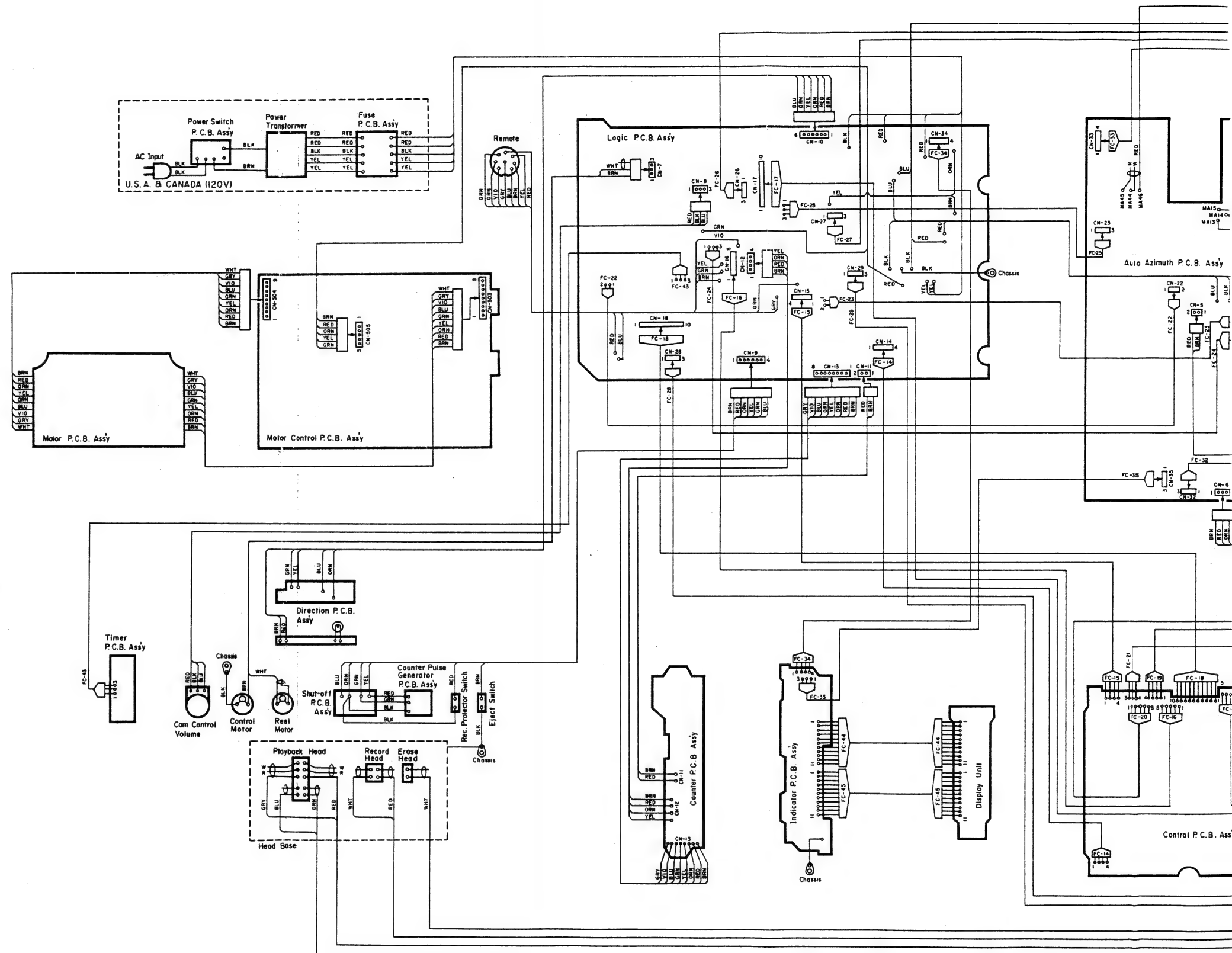
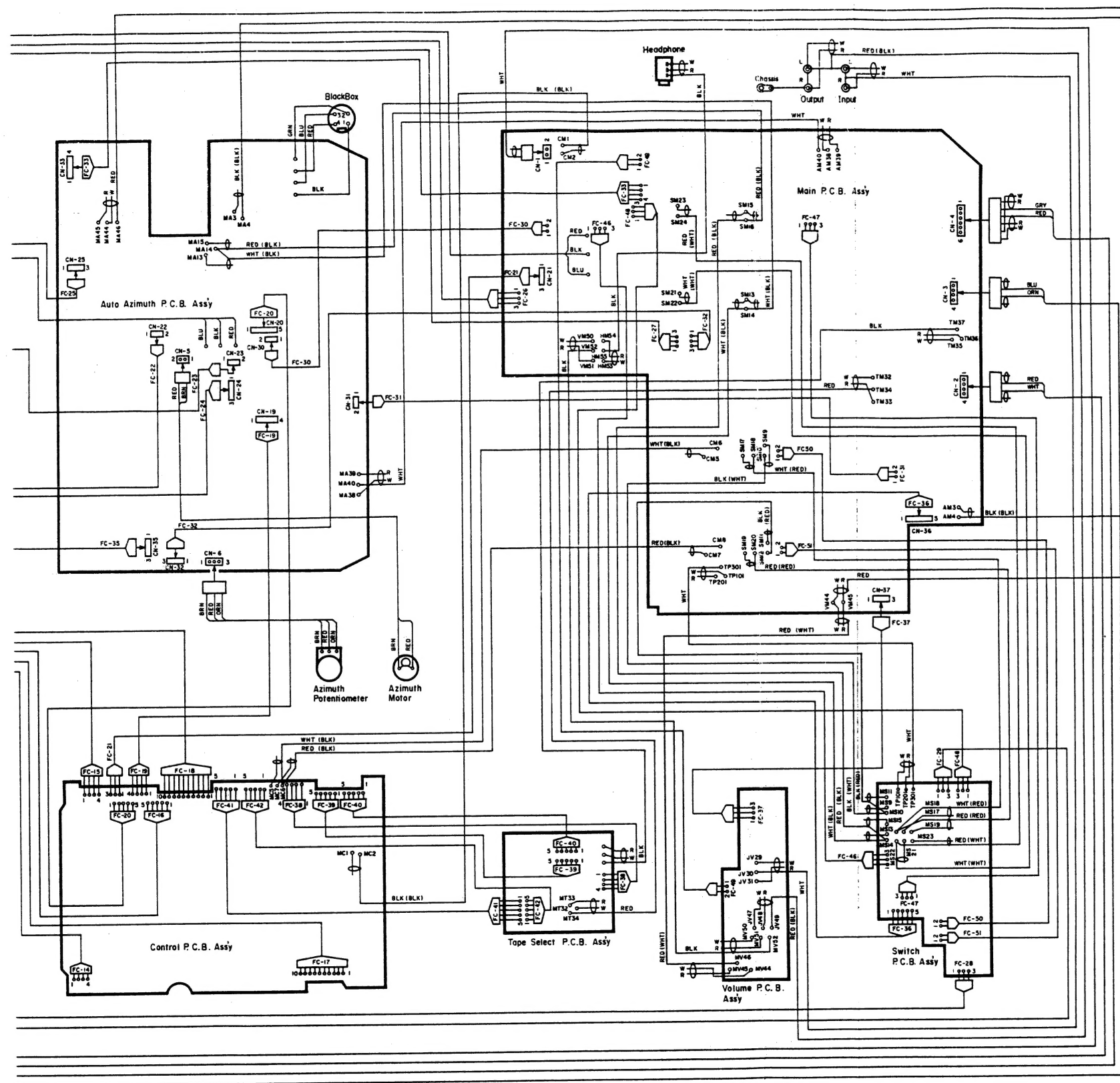


Fig. 8



9. TIMING CHART AND EQ. AMP. FREQUENCY RESPONSE

9.1. Overall Timing Chart

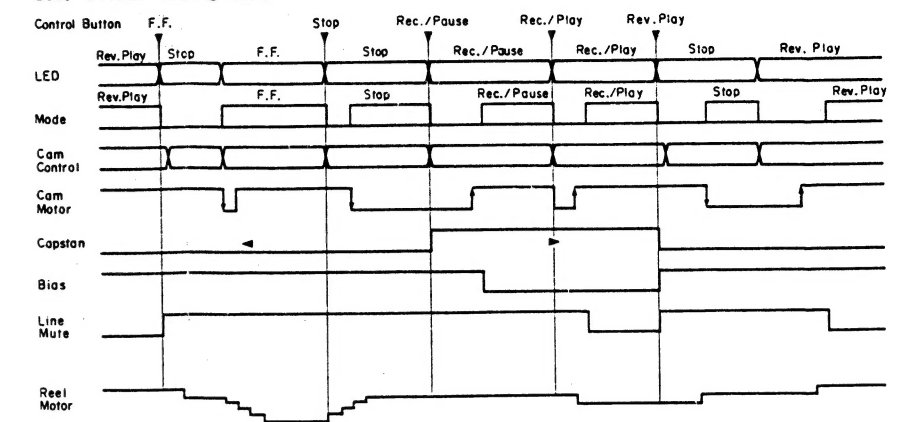


Fig. 9.1

9.2. Eq. Amp. Frequency Response

(1) Playback Frequency Response

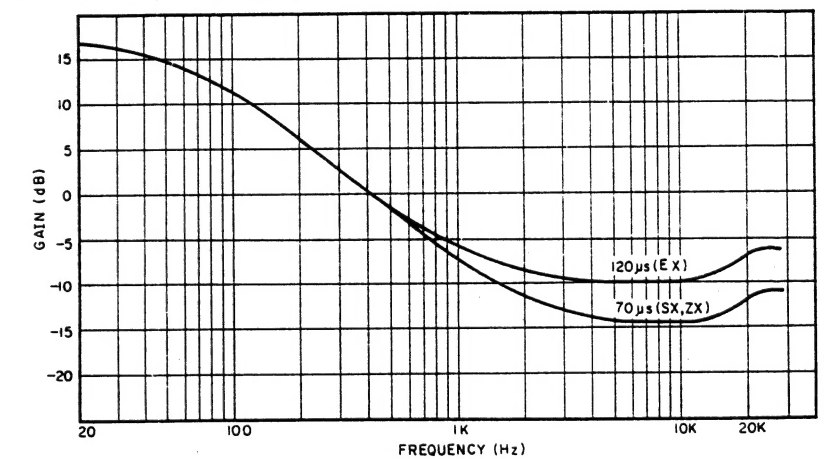


Fig. 9.2.1

(2) Record Current Frequency Response

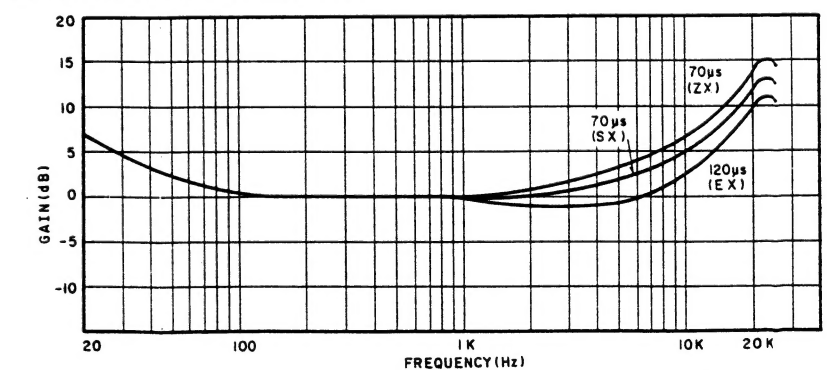


Fig. 9.2.2

10.1. Amplifier Section



10.2. Mechanism Control Section

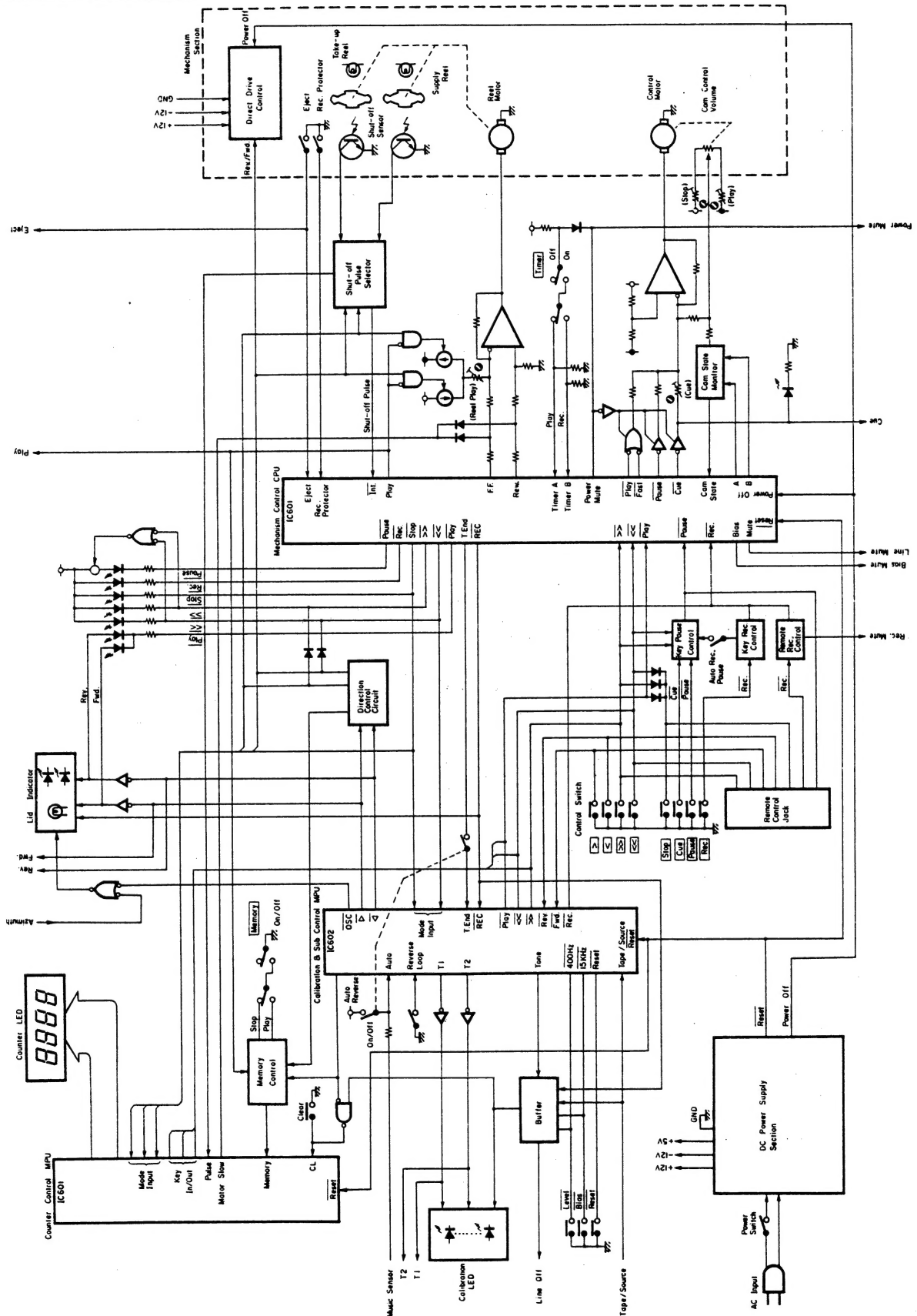


Fig. 10.2

11. SPECIFICATIONS

Track Configuration	4 Tracks/2-Channel Stereo (Playback auto reverse)
Heads	3 (Erase Head x 1, Record Head x 1, 4-Track, 4-Channel Playback Head x 1)
Motors	<ul style="list-style-type: none"> ● TRANSPORT Quartz PLL DC, Brushless, Slotless, Coreless, Super Linear Torque D.D. Motor (Capstan Drive) x 2 DC Motor (Reel Drive x 1) ● AUTO AZIMUTH CORRECTION DC Motor x 1 ● MECHANISM DC Motor x 1
Power Source	100, 120, 120/220-240, 220 or 240 V AC; 50/60 Hz (According to country of sale)
Power Consumption	45 W max.
Tape Speed	1-7/8 ips (4.8 cm/sec.)
Wow and Flutter	Less than 0.019% Wtd rms Less than 0.04% Wtd peak
Frequency Response	20 Hz–22,000 Hz ± 3 dB (recording level –20 dB, ZX Tape) 20 Hz–21,000 Hz ± 3 dB (recording level –20 dB, SX, EXII Tape)
Signal to Noise Ratio	Dolby C-Type NR on $<70 \mu\text{s}$, ZX Tape Better than 72 dB (400 Hz, 3% THD, IHF A-Wtd rms) Dolby B-Type NR on $<70 \mu\text{s}$, ZX Tape Better than 66 dB (400 Hz, 3% THD, IHF A-Wtd rms)
Total Harmonic Distortion	Less than 0.8% (400 Hz, 0 dB, ZX Tape) Less than 1% (400 Hz, 0 dB, SX, EXII Tape)
Erasure	Better than 60 dB (100 Hz, 0 dB)
Separation	Better than 37 dB (1 kHz, 0 dB)
Crosstalk	Better than 60 dB (1 kHz, 0 dB)
Bias Frequency	105 kHz
Input (Line)	50 mV, 50 k ohms
Output (Line)	1 V (400 Hz, 0 dB, Output Level Control at max.) 2.2 k ohms
(Headphones)	45 mV (400 Hz, 0 dB, output level control at max.) 8 ohms
BlackBox Series DC Output	± 10 V, 125 mA max.
Dimensions	450 (W) x 135 (H) x 300 (D) millimeters 17-3/4 (W) x 5-5/16 (H) x 11-13/16 (D) inches
Approximate Weight	9.5 kg 21 lb.

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